

FINAL

SITE WIDE INVESTIGATION

**REPORT OF NATURE & EXTENT OF
RELEASES TO GROUNDWATER FROM
THE SPECIAL STUDY AREAS**

**INTERNATIONAL STEEL GROUP
ISG SPARROWS POINT, INC. FACILITY
SPARROWS POINT, MARYLAND**



Prepared for

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| <i>Acronym</i> | <i>Description</i> |
|----------------|---|
| 1,1-DCA | 1,1-Dichloroethane |
| amsl | Above mean sea level |
| ASTM | American Society for Testing and Materials |
| BSC | Bethlehem Steel Corporation |
| BTEX | Benzene, toluene, ethylbenzene and xylenes |
| cm/sec | Centimeters per second |
| CMS | Corrective measures study |
| COPI | Chemicals of potential interest |
| DCC | Description of Current Conditions |
| DO | Dissolved oxygen |
| Eh | Redox potential |
| gpm | Gallons per minute |
| HCWWTP | Humphrey Canal Wastewater Treatment Plant |
| HSA | Hollow stem auger |
| ID | Inner diameter |
| IM | Interim measures |
| ISG | International Steel Group |
| MDE | Maryland Department of the Environment |
| Mgal/d | Millions of gallons per day |
| MGS | Maryland Geological Survey |
| N&E | Nature and Extent |
| NAVD 88 | North American Vertical Datum of 1988 |
| NPDES | National Pollutant Discharge Elimination System |
| OD | Outer diameter |
| ORP | Oxidation reduction potential |
| PVC | Polyvinyl chloride |
| QC | Quality control |
| RCRA | Resource Conservation and Recovery Act |
| RFA | RCRA Facility Assessment |
| RSC | Release Site Characterization |
| SAIC | Science Applications International Corporation |

| <i>Acronym</i> | <i>Description</i> |
|----------------|---|
| SSA | Special Study Area |
| SVOC | Semi-volatile organic compound |
| SWI | Site-Wide Investigation |
| µg/L | Micrograms per liter |
| USA | United States of America |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| VOC | Volatile organic compound |

1.1 PURPOSE

The evaluation of the nature and extent of releases to groundwater from Special Study Areas (SSAs) at the former Bethlehem Steel Corporation (BSC) Sparrows Point, Maryland facility was completed as part of a Site-Wide Investigation (SWI) program required by a Consent Decree (Civil Action JFM-97-558) entered into by BSC, the Maryland Department of the Environment (MDE), and the United States Environmental Protection Agency (USEPA) in October 1997. The BSC Sparrows Point facility was purchased by the International Steel Group (ISG) in May 2003.

The nature and extent investigation focused on five SSAs at the ISG Sparrows Point, Inc. facility in Sparrows Point, Maryland (Figure 1-1). The purpose of this report is to present the findings of field activities completed as part of the *Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas*, prepared by CH2M Hill dated July 2002 and modified in an addendum to the Nature and Extent (N&E) Work Plan submitted to the USEPA and the MDE in a letter dated March 12, 2004 (CH2M Hill, 2002b) (Abate, 2004).

The objectives of the N&E activities are to review and update the hydrogeologic model of the Site and to establish the vertical and horizontal limits of the chemicals of potential interest (COPI) in each of five SSAs: Greys Landfill, Humphrey Impoundment, Tin Mill Canal and Finishing Mills (typically grouped together along with Humphrey Impoundment), Coke Oven Area and Coke Point Landfill.

1.1.1 Consent Decree

On October 10, 1997, the United States of America (USA), on behalf of the USEPA, and the MDE filed a complaint against BSC (now ISG) seeking relief from an alleged endangerment to public health, welfare, or the environment from contamination at and around ISG's Sparrows Point facility (the Site), located in Baltimore County, Maryland. This complaint, or multimedia Consent Decree, was filed through the US District Court for the District of Maryland. As ISG purchased the Sparrows Point facility in the summer of 2003, USEPA is currently in the process of issuing a Consent Decree modification that transfers compliance requirements for the Consent Decree to ISG.

The Consent Decree provided a synopsis of activities and conditions of concern at the Site, outlined corrective measures to be performed, and mandated a waste minimization plan for the Site. Corrective measures defined in the Consent Decree include interim measures (IM), a SWI, and corrective measures study (CMS).

Section V-B of the Decree requires the completion of a SWI program for the facility. Major submittals completed to-date for the SWI program include the following:

- *Description of Current Conditions (DCC)*, January 1998 (Rust, 1998),
- *SWI Work Plan - Groundwater Study*, June 2000 (CH2M Hill, 2000),
- *SWI Groundwater Study Report*, July 2001 (CH2M Hill, 2001b),
- *SWI Release Site Characterization (RSC) Study*, June 2002 (CH2M Hill, 2002a),

- *SWI Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas*, July 2002, subsequently modified on September 30, 2002 and on March 12, 2004 (CH2M Hill, 2002b) (SAIC, 2002) (Abate, 2004).

1.1.2 Nature and Extent Work Plan

A N&E Work Plan was developed in July 2002 and amended on September 30, 2002 and on March 12, 2004, in order to conduct a SWI and thereby satisfy one of the requirements of the Consent Decree. The following presents a list of documents submitted as part of the development of the N&E Work Plan:

- July 2002, *SWI/Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas* for BSC, Sparrows Point Division, Maryland (CH2M Hill, 2002b);
- September 30, 2002, *Addendum to SWI Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from Special Study Areas* for BSC, Sparrows Point Division, Maryland (SAIC, 2002); and
- March 12, 2004, ISG issued an *Addendum to SWI Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from Special Study Areas* for ISG, Sparrows Point Division, Maryland (Abate, 2004).

The N&E Work Plan, as amended by ISG on March 12, 2004, was approved by USEPA on April 13, 2004.

1.2 PREVIOUS INVESTIGATIONS

This section provides a brief description of previous investigations completed at the Sparrows Point facility, as required by the Consent Decree. Major submittals completed to date as part of the SWI include:

- *DCC*, January 1998 (Rust, 1998);
- *SWI Work Plan – Groundwater Study*, June 2000 (CH2M Hill, 2000);
- *SWI, Groundwater Study Report*, July 2001 (CH2M Hill, 2001b); and,
- *SWI RSC Study*, June 2002 (CH2M Hill, 2002a).

A brief description of previous investigations is presented in the following sections.

1.2.1 Description of Current Conditions Report

The DCC Report served as the starting point for planning and conducting a SWI at the Sparrows Point facility. The DCC Report included the following information:

- Facility background information;
- Evaluation of potential contaminant sources;

- Evaluation of potential migration pathways;
- Evaluation of potential receptors; and,
- A description of the implementation of the interim measures at the Rod and Wire Mill.

USEPA and MDE issued approval of the DCC Report on December 9, 1998, with the contingency that subjects of continued disagreement be addressed as subsequent investigations were implemented (Rust, 1998).

1.2.2 Site-Wide Investigation Groundwater Study

A geologic and groundwater investigation was completed as part of the SWI Groundwater Study. The objectives of the investigation were as follows:

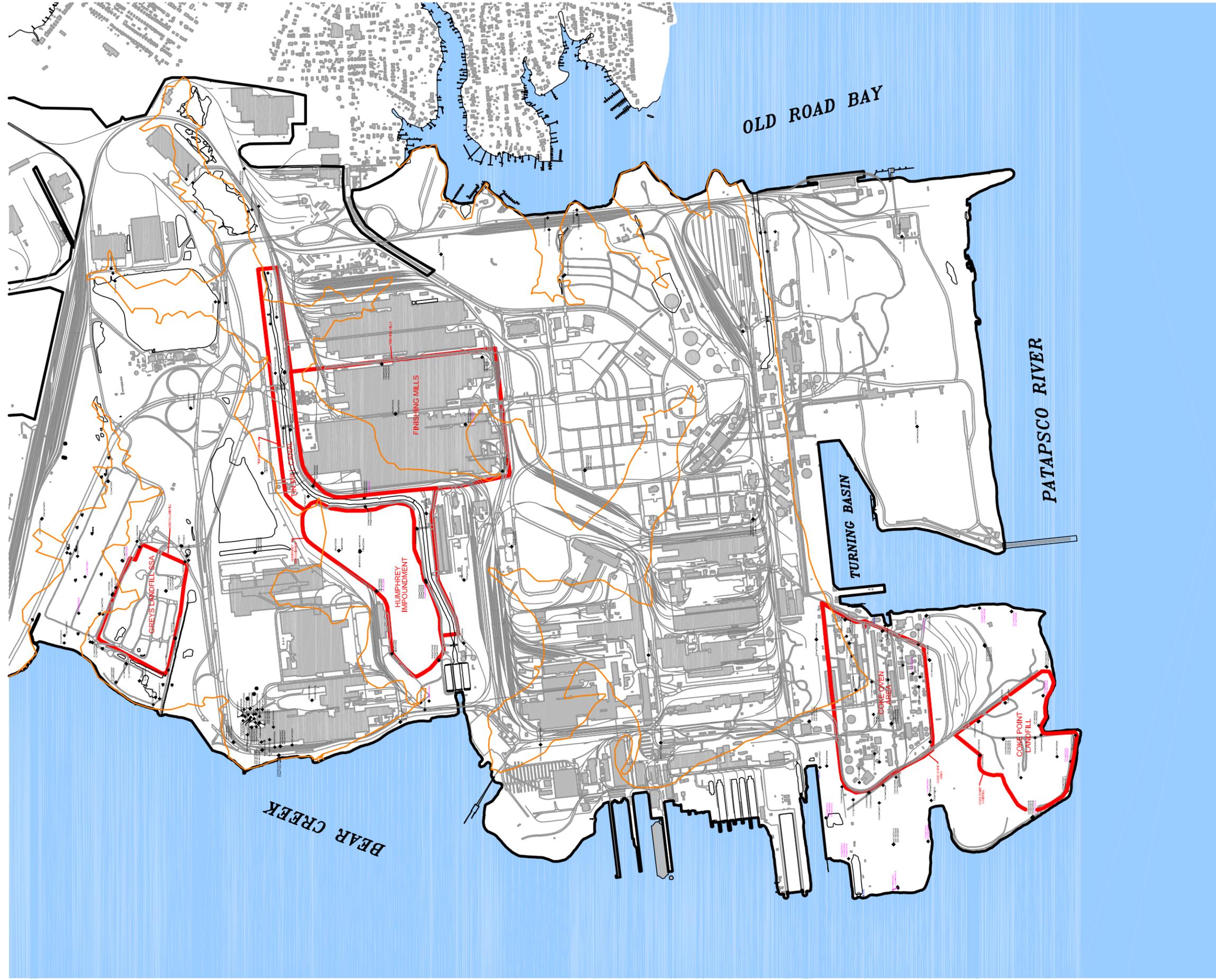
- Develop an improved understanding of the character and distribution of geologic materials from the ground surface to depths of 120 feet on a site-wide basis;
- Obtain information of the permeability of geologic materials and on the distribution of hydraulic head between them;
- Obtain information on inputs and outputs of the groundwater flow systems and on the interaction between groundwater and surface water within and adjacent to the Site;
- Integrate the geologic and groundwater information by developing a computer model of groundwater flow on a site-wide basis;
- Obtain preliminary information on the effects of historical groundwater conditions on vertical groundwater flow in the upper 120 feet at the Site; and
- Develop an improved understanding of the current use of groundwater on-site and in adjacent communities.

A detailed description of the findings of the geologic and groundwater investigation is presented in the *Site Wide Investigation Groundwater Study Report* (CH2M Hill, 2001b).

1.2.3 Release Site Characterization Study

The RSC Study was designed to focus on five SSAs at the Sparrows Point facility. The purpose of the RSC Study was to define the stratigraphy of the upper 100 to 120 feet of subsurface materials at each of the five SSAs, as well as to define the occurrence, movement, and quality of groundwater within the upper groundwater system at the SSAs. Details of the findings of the RSC Study are presented in the *SWI-RSC Study* (CH2M Hill, 2002a).

**SECTION ONE
FIGURES**



Special Study Area Boundary

LEGEND

SSA Special Study Area



0 1500
SCALE 1" = 1500'

ISG SPARROWS POINT, INC.

Figure 1-1
Site Features Map



In order to accomplish the objectives of the N&E investigation, three distinct field sampling efforts were performed. The field sampling investigations were conducted in late 2002 through early 2003, in late 2003, and in mid-2004 as summarized in the following report sections. A summary of field activities performed as part of the N&E is presented in Table 2-1.

2.1 FALL 2002 FIELD ACTIVITIES

The first phase of the N&E field activities was performed from November 2002 through February 2003. These field activities are referred to as Fall 2002 field activities. The Fall 2002 field activities are described in the September 30, 2002 *Addendum to the Site Wide Investigation to Evaluate the Nature and Extent of Releases to Groundwater From Special Areas* and included the following tasks (SAIC, 2002):

- Limited groundwater sampling and analyses performed in November and December 2002 completed to provide supporting data for the construction of proposed piezometers;
- The installation of piezometers to supplement the existing piezometer network to evaluate the horizontal and vertical extent of COPI parameters in the groundwater in each of the five SSAs;
- Collection and analyses of vertical profiles of in-situ groundwater data during the installation of selected piezometers; and,
- Collection of water level data to update the groundwater flow conditions across the Site.

Piezometers installed deeper than the shallow groundwater interface were installed utilizing rotonic drilling methods. Rotonic drilling methods were used to provide a continuous geologic core of the subsurface materials and specific interface zones between site fill and natural strata and to facilitate the collection and analysis of a vertical profile of in-situ groundwater quality data that was collected during the advancement of the rotary sonic boreholes. The geologic and in-situ groundwater data were used to determine the depth and screened intervals of the piezometers. Analytical results of Isoflow water samples are presented in Table 2-1

Piezometers installed in the shallow water interface were installed utilizing hollow stem auger (HSA) drilling methods.

The activities performed and piezometers sampled in each of the five SSAs during the Fall 2002 field activities are summarized in Table 2-1.

2.1.1 Rotary Sonic and Hollow Stem Auger Drilling and Sampling

In December 2002, Eichelbergers, Inc. and Prosonic mobilized to the Site to perform the auger rig and rotary sonic drilling services, respectively. Science Applications International Corporation (SAIC) collected samples at locations as summarized in Table 2-1 and as identified in the July 2002, *Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas* (CH2M Hill, 2002b). Field activities are detailed in the following subsections.

2.1.1.1 Rotary Sonic Drilling Methods

The rotary sonic rig used three nested lines of drill pipe during drilling, the inner string, the outer string, and the override casing. Drill rods and core barrel were a minimum 8-inch inside diameter (ID). The inner string of drill rods had a core barrel attached, and all overburden core sampling was performed 10 feet ahead of the outer string of drill casing. After the core barrel was advanced, the outer drill casing was advanced using water as necessary. The outer casing was left in place to hold the borehole open, the core barrel was removed from the borehole, and the continuous core sample with 6-inch outside diameter (OD) was extracted into plastic sleeves for lithologic classification and headspace screening. Lithologic information and soil screening results were recorded on a boring log maintained for each boring and were used to construct the soil boring logs provided in Appendix A.

2.1.1.2 HSA Drilling Methods

Piezometers constructed in the shallow water table interface during the N&E study were installed using HSA drilling methods. The HSA borings were advanced using 4¼-inch ID HSAs. Split-spoon samples were collected in accordance with the American Society for Testing and Materials (ASTM) Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D-1586) procedure (ASTM, 1999). Standard penetration data and soil screening results were recorded on a boring log maintained for each boring and were used to construct the soil boring logs provided in Appendix A.

The HSAs, temporary outer casing, drill rods, core barrels and other downhole drilling and sampling tools were properly decontaminated prior to the initiation of drilling activities and between each piezometer location.

2.1.2 IsoFlow® Profile Sampling and Analysis

In-situ groundwater samples were collected and analyzed during the advancement of the rotary-sonic boreholes. The in-situ groundwater samples were collected utilizing the IsoFlow® vertical profiling sampling method, which was developed for use with rotary-sonic drilling methods. A summary of the in-situ groundwater samples collected utilizing the IsoFlow® sampling method is presented in Table 2-2. In-situ groundwater samples were collected in the following manner:

- The core barrel and core sample were retrieved at the desired depth;
- The IsoFlow® sampler screened section was lowered to the desired depth. An inflatable packer was lowered into the sonic drill rig rods to isolate the sampling area;
- The override casing was pulled back approximately 5 feet to expose the screen to the formation;
- A 2-inch submersible pump was lowered to the desired depth, typically in the center of the screened interval;
- Pumping continued until the volume of water present in the well screen plus the volume of water below the pump were evacuated. Additional water volume was pumped if water was added to facilitate the advancement of the casing. Temperature, pH, turbidity,

dissolved oxygen and salinity were measured with a Horiba Model U-1Q flow-cell. Measurements were recorded on groundwater sample logs which are included in Appendix B;

- Samples were collected directly into laboratory supplied glassware and immediately placed on ice;
- Samples were transported to a local analytical laboratory and analyzed for volatile organic compounds (VOCs) plus naphthalene using Method 8021 modified;
- IsoFlow[®] sampling equipment was removed from the borehole and properly decontaminated.

All in-situ groundwater samples were analyzed by an on-site laboratory for VOCs by USEPA SW846 Method 8260 plus naphthalene. Results are illustrated on Figures 2-1 through 2-3 and are further discussed in Section 4.0 of this report.

2.1.3 Piezometer Installation and Development

2.1.3.1 Piezometer Installation

Table 2-1 presents a summary of the piezometers installed in each of the five SSAs during the Fall 2002 field activities. Locations of piezometers installed during and prior to the Fall 2002 field effort are also shown on Figures 2-1 through Figures 2-3. Piezometer construction details are included on the boring logs in Appendix A. Each piezometer was generally constructed by using a 10-foot section of 2-inch ID, 0.010-inch slotted, polyvinyl chloride (PVC) well screen and 2-inch ID, Schedule 40, PVC blank casing. Blank casing was added above the screened portion so that the top of the well casing was either 3 inches below ground surface (for flush-mount finishing) or approximately 2 feet above the existing ground surface (for standpipe finishing).

Morie #1 filter sand was added to the annular space between the borehole and the well screen by utilizing the drilling equipment as a tremie. The sand was brought to a level of approximately 1 foot above the top of the screened interval. Bentonite chips were used to seal the piezometer and hydrated to create a watertight seal above the filter sand layer. The upper 1 to 3 feet of the borehole were typically completed with concrete.

Piezometers constructed in the intermediate and lower groundwater zones were installed utilizing rotary sonic drilling methods. The piezometer locations are shown in Figure 1-1. Piezometer construction details are included on the boring logs in Appendix A. Each piezometer was generally constructed by using a 10-foot section of 2-inch ID, 0.010-inch slotted, PVC U-Pack 2-inch by 3-inch well screen and 2-inch ID, schedule 40, PVC blank casing. Blank casing was added above the screened portion so that the top of the well casing was either 3 inches below ground surface (for flush-mount finishing) or approximately 2 feet above the existing ground surface (for standpipe finishing). Centering guides were placed at the bottom of the screen and above the interval in which the bentonite seal was placed. The rotary sonic piezometers were constructed inside of the temporary outer casing of the boreholes, once the borehole was advanced to the desired depth. Morie #1 filter sand was added to the annular space between the borehole and the outer casing. The sand was brought to a level of approximately 1

foot above the top of the screened interval followed by a 2- to 3-foot bentonite seal. After setting the well screen, riser, filter pack and bentonite seal, the piezometer was grouted as the temporary outer casing was withdrawn, thereby preventing cross contamination. If the borehole was drilled to a depth greater than that at which the piezometer was to be set, the borehole was backfilled with bentonite pellets or bentonite-cement slurry to a depth of approximately 1 foot below the intended piezometer depth. Approximately 1 foot of clean sand was placed on top of the bentonite to return the borehole to the proper depth for piezometer installation.

For piezometers that were completed above grade, a locking steel protective casing set in a concrete pad was installed per the July 2002 Work Plan. Up to four concrete-filled guard posts were also installed around piezometers located within high-traffic areas. For piezometers with flush-mount completions, a Morrison 9-inch or 12-inch 519 manhole cover or equivalent, with a rubber-sealed cover and drain were installed with a concrete pad. Flush-mount piezometers were constructed with sufficient strength to withstand normal vehicular traffic. Each piezometer was labeled on the exterior of the locking cap or protective casing with a metal stamp or indelible marker indicating the permanent piezometer number.

2.1.3.2 Piezometer Development

Piezometer development was accomplished using a combination of surging throughout the well screen and pumping, until the physical and chemical parameters of the discharge water that were measured in the field were stabilized, and the turbidity of the discharge water was substantially reduced. The surging apparatus included two surge blocks separated by approximately 2 feet of coarsely-slotted pipe. The lower surge block was solid; the upper surge block was open and attached to riser pipe leading to the ground surface. Water was pumped continuously from the surge block screened interval throughout the surging process. The pumping was accomplished by airlift induction methods or using a centrifugal pump.

Piezometer development began by surging the well screen, starting at the bottom of the screen and proceeding upward, throughout the screened zone.

Following surging, the piezometer was pumped to remove the fine materials that were drawn into the piezometer. During pumping, measurements of pH, temperature and specific conductance were recorded. Development continued by alternately surging and pumping until the discharge water was free from sand and silt, the turbidity was substantially reduced, and the pH, temperature and specific conductance had stabilized at regional background levels, based on historical data. Development continued for a minimum of 30 minutes. Development forms for each of the piezometers installed during the Fall 2002 N&E activities are included in Appendix B.

Piezometer development equipment was decontaminated prior to initial use and after the development of each piezometer.

2.1.4 Groundwater Purging, Sampling, and Analysis

Prior to sampling, each piezometer was purged until a minimum of three well volumes of water were removed from each piezometer, until the piezometer was dry or until the field parameters: pH, conductivity, temperature, redox potential (Eh), dissolved oxygen and turbidity were

stabilized within 10%. Piezometers were purged and sampled using low-flow purging methods. Calibration results are recorded in the field log book. Water quality measurements are recorded on the groundwater purge summary sheets, which are included in Appendix B. Purge water was stored in drums and transported to the ISG drum storage area pending disposal.

The samples collected for laboratory analysis were packed in insulated coolers with ice and transported to Gascoyne Laboratories for analyses. Appropriate chain-of-custody procedures and documentation were maintained, in order to provide for proper handling of samples. The data quality review report is presented in Section 4.1 of this report.

2.1.5 Water Level Measurements

During the Fall 2002 field activities, a round of groundwater measurements were collected on October 31, 2002 and January 18, 2003 to assess the current groundwater conditions. Water level measurements collected during the Fall 2002 field activities are presented on Table 2-3.

2.1.6 Site Surveying

Following the completion of the piezometers constructed during the Fall 2002 field activities, all new piezometers were horizontally and vertically surveyed by a State of Maryland Licensed Surveyor. All surveying activities were performed by Whitman-Requardt and Associates, LLP (Whitman-Requardt) of Baltimore, Maryland. Final northing, easting and elevation data for all piezometers installed and sampled during the RSC and the N&E Studies are presented on Table 2-3.

2.2 DECEMBER 2003 FIELD ACTIVITIES

The second phase of the N&E field activities was performed in December 2003. These field activities supplemented data collected during the Fall 2002 field effort and included the collection of water level data, tidal study measurements, and hydraulic conductivity data to update groundwater flow conditions across the Site. The activities performed in each of the five SSAs during the December 2003 field activities are summarized in Table 2-1.

2.2.1 Water Level Measurements

During the December 2003 field activities, a round of groundwater measurements was collected on December 18, 2003 to assess the current groundwater conditions. Water level measurements collected during the December 2003 field activities are presented on Table 2-3. A team of four field technicians simultaneously measured static water levels in the various piezometers. The goal was to minimize the length of time required to measure the water levels. This approach resulted in all water levels being measured over an approximately four-hour period. The water levels were measured during low slack tide. This is the same tidal period when groundwater elevations were previously measured, which thereby increased comparability of the data. Also, low slack tide is a relatively conservative time-frame to measure the water levels because it represents the timeframe when the water-table gradient toward surrounding water bodies is

expected to be steepest. A discussion of the groundwater elevation data is presented in Section 3.3.9 of this report.

2.2.2 Tidal Study

In December 2003, a tidal study was performed to document tidal and surface water elevation variations and to evaluate potential effects on groundwater elevations in the monitored formations. The tidal study consisted of installing pressure transducers and data loggers on 13 piezometers and at three surface water locations: near the graving dock in the former BSC Shipyard (SWG01); near Outfall 021 (SWG02); and in the Turning Basin (SWG03). Surface water locations are presented on Figure 2-3. Generally, the data loggers were programmed to collect water level measurements every 15 minutes for two weeks. The goal was to estimate the influence of tidal fluctuations on groundwater levels at various different horizontal and vertical locations. Following the two-week monitoring period, the transducers were removed, and the data was down loaded to laptop computer. Tidal study results are discussed in Section 3.3.9 of this report, and surface water gauge and associated piezometer locations are illustrated on Figure 2-3.

2.2.3 Hydraulic Conductivity Tests

During the December 2003 field activities, slug tests were conducted on 14 piezometers to update existing hydraulic conductivity data. The slug test consisted of submerging a sand-filled PVC slug and then monitoring the water level until it stabilized. Generally, stabilization occurred within a one-hour period. Then the slug was rapidly removed, and the recovery of the water level was monitored until it stabilized, also generally within one hour. Water levels were measured and recorded using a Mini-Troll Pro pressure transducer. The water level data was downloaded from the field unit and evaluated utilizing Win-Situ Version 4.46. Slug test results are presented and discussed in Section 3.3.9 of this report.

2.3 JUNE 2004 FIELD ACTIVITIES

The most current phase of the N&E field activities was performed in June 2004 through July 2004. These field activities are referred to as June 2004 field activities. The June 2004 field activities are described in the March 12, 2004, *Addendum to the Site Wide Investigation to Evaluate the Nature and Extent of Releases to Groundwater from Special Areas* (Abate, 2004). Field tasks included groundwater sampling performed pursuant to Table 1 of March 2004 Addendum Letter, and the collection of water level data to update the groundwater flow conditions across the Site.

2.3.1 Piezometer Purging and Sampling Procedures

Piezometers were purged and sampled using low flow techniques. The pump consisted of a peristaltic pump operated at a flow rate of less than 1 liter per minute. After a minimum of one standing well volume of water was removed, purging continued while the following stabilization parameters were measured: pH, dissolved oxygen (DO), conductivity, temperature, oxidation reduction potential (ORP), and turbidity. After all parameters had stabilized, the water samples

were collected. Water quality measurements are recorded on the groundwater purge summary sheets, which are included in Appendix B. Additionally, a field sampling summary for the June 2004 groundwater sampling event is included in Appendix B. Purge water was stored in drums and transported to the ISG drum storage area pending disposal.

The samples collected for laboratory analysis were packed in insulated coolers with ice and transported to Gascoyne Laboratories for analyses. Appropriate chain-of-custody procedures and documentation were maintained in order to provide for proper handling of samples. The data quality review report is presented in Section 4.1 of this report.

In some instances, the piezometers went dry during sample collection. In this instance, sampling extended over a longer sampling period while water levels were allowed to recover.

2.3.2 Water Level Measurements

Groundwater level measurements were collected on June 14, 2004, to assess the current flow conditions and are presented in Table 2-3. As in the 2002 and 2003 groundwater level measurement events, a team of four field technicians simultaneously measured static water levels in the various piezometers within a four-hour period during low-slack tide, thereby increasing comparability of the data. A discussion of the groundwater elevation is presented in Section 3.3.9 of this report.

**SECTION TWO
TABLES**

**Table 2-1. Summary of Field Activities
Evaluation of Nature and Extent of Releases to Groundwater from the Special Study Areas
ISG Sparrows Point, Inc.**

| Special Study Area | Field Sampling Effort | | |
|---|--|---|--|
| | Fall 2002 | December 2003 | June-July 2004 |
| Greys Landfill | <ul style="list-style-type: none"> • Installation of one rotary sonic piezometer • Installation of two auger piezometers • Isoflow sampling from one new piezometer • Groundwater sampling from two piezometers for VOCs | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Slug testing of one piezometer | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Groundwater sampling from six piezometers for full COPI list • Groundwater sampling from three piezometers for COPI list metals only |
| Humphrey Impoundment/ Tin Mill Canal/ Finishing Mills | <ul style="list-style-type: none"> • Installation of two rotary sonic piezometers • Installation of three auger piezometers • Isoflow sampling from one new piezometer • Groundwater sampling from five piezometers for VOCs | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Slug testing of one piezometer | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Groundwater sampling from 13 piezometers for full COPI list |
| Coke Oven Area | <ul style="list-style-type: none"> • Installation of seven rotary sonic piezometers • Installation of nine auger piezometers • Isoflow sampling from five new piezometers • Groundwater sampling from eight piezometers for VOCs | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Slug testing of eight piezometers | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Groundwater sampling from 11 piezometers for full COPI list plus natural attenuation parameters • Groundwater sampling from 24 piezometers for full COPI list • Groundwater sampling from one piezometer for COPI list metals only |

**Table 2-1. Summary of Field Activities
Evaluation of Nature and Extent of Releases to Groundwater from the Special Study Areas
ISG Sparrows Point, Inc.**

| | | | |
|-------------------------------------|--|--|---|
| Coke Point Landfill | <ul style="list-style-type: none"> • Installation of four rotary sonic piezometers • Installation of three auger piezometers • Isoflow sampling from four new piezometers • Site-wide groundwater level measurements • Groundwater sampling from two piezometers for VOCs | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Slug testing of one piezometer | <ul style="list-style-type: none"> • Site-wide groundwater level measurements • Groundwater sampling from six piezometers for full COPI list plus natural attenuation parameters • Groundwater sampling from 10 piezometers for full COPI list • Groundwater sampling from four piezometers for COPI list metals only |
| Miscellaneous Site-Wide Piezometers | | <ul style="list-style-type: none"> • Site-wide groundwater level measurements | <ul style="list-style-type: none"> • Site-wide groundwater level measurements |

Table 2-2
Summary of Isoflow Sample Results
Volatile Organics - Fall 2002
Nature and Extent Investigation
ISG Sparrows Point, Inc.

| Sample ID Location Depth | CO27-RS-25 | CO27-RS-35 | CO27-RS-45 | CO27-RS-55 | CO27-RS-115 | CO28-RS-25 | CO28-RS-35 | CO28-RS-45 | CO28-RS-57 | CO29-RS-25 |
|--------------------------------|------------|------------|------------|------------|-------------|------------|------------|------------|------------|------------|
| | CO27 25 | CO27 35 | CO27 45 | CO27 55 | CO27 115 | CO28 25 | CO28 35 | CO28 45 | CO28 57 | CO29 25 |
| Analyte, ug/L | | | | | | | | | | |
| 1,1,1-Trichloroethane | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| 1,1-Dichloroethane | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| 1,1-Dichloroethene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| 1,2-Dichloroethane | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Benzene | 52000 | 5300 | 470000 | 18,000 | 100 | 46000 | 140000 | 18000 | 250000 | 86 |
| Carbon tetrachloride | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Chlorobenzene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| cis-1,2-Dichloroethene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Ethylbenzene | 500 U | 78 | 880 | 120 | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| m,p-Xylene | 770 | 29 | 13,000 | 210 | 1.0 U | 1500 | 2700 | 270 | 1400 | 42 |
| Methylene chloride | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Naphthalene | 3,800 | 40 | 500 U | 11 | 1.0 U | 4700 | 1000 U | 100 U | 1000 U | 2900 |
| o-Xylene | 500 U | 53 | 3,900 | 70 | 1.0 U | 460 | 1000 U | 100 U | 1000 U | 15 |
| Tetrachloroethene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Toluene | 10000 | 23 | 76000 | 660 | 2.6 | 10000 | 25000 | 3300 | 30000 | 28 |
| trans-1,2-Dichloroethene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Trichloroethene | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |
| Vinyl chloride | 500 U | 5.0 U | 500 U | 10 U | 1.0 U | 100 U | 1000 U | 100 U | 1000 U | 10 U |

Table 2-2
Summary of Isoflow Sample Results
Volatile Organics - Fall 2002
Nature and Extent Investigation
ISG Sparrows Point, Inc.

| Sample ID Location Depth | CO29-RS-45 | CO29-RS-55 | CO29-RS-65 | CO30-RS-25 | CO30-RS-35 | CO30-RS-45A | CO30-RS-45B | CO30-RS-55 | CO30-RS-65 | CO33-RS-25 |
|--------------------------------|------------|------------|------------|------------|------------|-------------|-------------|------------|------------|------------|
| | CO29 45 | CO29 55 | CO29 65 | CO30 25 | CO30 35 | CO30 45 | CO30 45 | CO30 55 | CO30 65 | CO33 25 |
| Analyte, ug/L | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| 1,1-Dichloroethane | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| 1,1-Dichloroethene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| 1,2-Dichloroethane | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| Benzene | 87 | 2.2 | 2.8 | 75000 | 73000 | 6000 | 2000 | 37 | 180 | 200000 |
| Carbon tetrachloride | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| Chlorobenzene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| cis-1,2-Dichloroethene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| Ethylbenzene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| m,p-Xylene | 22 | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.1 | 5000 U |
| Methylene chloride | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1 | 19 | 5000 U |
| Naphthalene | 1,700 | 2.1 | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| o-Xylene | 8 | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 26 | 5000 U |
| Tetrachloroethene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 5.1 | 5000 U |
| Toluene | 12 | 0.8 J | 1.0 U | 9000 | 9000 | 600 | 250 U | 8 | 69 | 20000 |
| trans-1,2-Dichloroethene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| Trichloroethene | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |
| Vinyl chloride | 5.0 U | 1.0 U | 1.0 U | 5000 U | 2500 U | 250 U | 250 U | 1.0 U | 1.0 U | 5000 U |

Table 2-2
Summary of Isoflow Sample Results
Volatiles Organics - Fall 2002
Nature and Extent Investigation
ISG Sparrows Point, Inc.

| Sample ID Location Depth | CO33-RS-35 | | CO33-RS-55 | | CO33-RS-65 | | CO33-RS-74 | | CO34-RS-55 | | CO35-RS-25 | | CO35-RS-45 | | CO35-RS-65 | | CP05-RS-25 | | CP05-RS-35 | | |
|--------------------------------|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|-------|------------|-------|--|
| | CO33 | 35 | CO33 | 55 | CO33 | 65 | CO33 | 74 | CO34 | 55 | CO35 | 25 | CO35 | 45 | CO35 | 65 | CP05 | 25 | CP05 | 35 | |
| Analyte, ug/L | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| 1,1-Dichloroethane | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| 1,1-Dichloroethene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| 1,2-Dichloroethane | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Benzene | 200000 | | 67000 | | 8,700 | | | | 1.0 U | | 400 | | 1.0 U | | 1.0 U | | | 39 | | 120 | |
| Carbon tetrachloride | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Chlorobenzene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| cis-1,2-Dichloroethene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Ethylbenzene | 1000 U | | 250 U | | 5.7 | | | | 1.0 U | | 9 | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| m,p-Xylene | 2000 | | 250 U | | 5.2 | | | | 1.0 U | | 110 | | 1.0 U | | 1.0 U | | | 5.0 U | | 3 J | |
| Methylene chloride | 1000 U | | 250 U | | 5.0 U | | | | 2.4 | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Naphthalene | 1000 U | | 250 U | | 5.0 U | | | | 3 | | 1,100 | | 1.0 U | | 1.0 U | | | 84 | | 280 | |
| o-Xylene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 36 | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Tetrachloroethene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Toluene | 20000 | | 250 U | | 5.0 U | | | | 1.0 U | | 90 | | 1.0 U | | 1.0 U | | | 8.6 | | 16 | |
| trans-1,2-Dichloroethene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Trichloroethene | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |
| Vinyl chloride | 1000 U | | 250 U | | 5.0 U | | | | 1.0 U | | 10 U | | 1.0 U | | 1.0 U | | | 5.0 U | | 5.0 U | |

Table 2-2
Summary of Isoflow Sample Results
Volatile Organics - Fall 2002
Nature and Extent Investigation
ISG Sparrows Point, Inc.

| Analyte, ug/L | Sample ID | | CP05-RS-45 | | CP15-RS-25 | | CP15-RS-35 | | CP15-RS-85 | | CP16-RS-34 | | CP16-RS-44 | | CP16-RS-54 | | CP16-RS-64 | | CP16-RS-74 | | CP16-RS-84 | |
|--------------------------|-----------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
| | Location | Depth | CP05 | CP15 | CP15 | CP15 | CP15 | CP15 | CP15 | CP15 | CP16 | CP16 |
| 1,1,1-Trichloroethane | | | 1.0 U | 1.0 U |
| 1,1-Dichloroethane | | | 1.0 U | 1.0 U |
| 1,1-Dichloroethene | | | 1.0 U | 1.0 U |
| 1,2-Dichloroethane | | | 1.0 U | 1.0 U |
| Benzene | | 26 | 1 | | 4.2 | | | | 1.0 U | 1.0 U | 160 | | 190 | | 130 | | 2.6 | | 54 | | 74 | 84 |
| Carbon tetrachloride | | | 1.0 U | 1.0 U |
| Chlorobenzene | | | 1.0 U | 1.0 U |
| cis-1,2-Dichloroethene | | | 1.0 U | 1.0 U |
| Ethylbenzene | | 1.2 | 1.0 U | 1.0 U | 0.7 J | 1.0 U | 1.0 U | 1.0 U |
| m,p-Xylene | | 5.9 | 1.0 U | 1.0 U | 4.4 | 1.0 U | 4.5 | 1.0 U | 1.0 U | 1.0 U |
| Methylene chloride | | | 1.0 U | 1.0 U |
| Naphthalene | | 280 | 1.0 U | 1.0 U | 98 | 1.0 U | 140 | 1.0 U | 430 | 1.0 U | 7.2 | 1.0 U | 54 | 1.0 U | 74 | 1.0 U |
| o-Xylene | | 3.2 | 1.0 U | 1.0 U | 2.8 | 1.0 U | 5 | 1.0 U | 5.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| Tetrachloroethene | | | 1.0 U | 1.0 U |
| Toluene | | | 1.0 U | 1.0 U | 0.9 J | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 11 | 1.0 U | 13 | 1.0 U | 10 | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| trans-1,2-Dichloroethene | | | 1.0 U | 1.0 U |
| Trichloroethene | | | 1.0 U | 1.0 U |
| Vinyl chloride | | | 1.0 U | 1.0 U |



Table 2-2
 Summary of Isoflow Sample Results
 Volatile Organics - Fall 2002
 Nature and Extent Investigation
 ISG Sparrows Point, Inc.

| Sample ID Location Depth | CPI7-RS-25 | | CPI7-RS-35 | | CPI7-RS-45 | | CPI7-RS-55 | | GL18-RS-25 | | GL18-RS-45 | | GL18-RS-25 | | GL18-RS-45 | | GL18-RS-25 | | GL18-RS-45 | | |
|--------------------------------|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|------------|----|-------|
| | CPI7 | 25 | CPI7 | 35 | CPI7 | 45 | CPI7 | 55 | GL18 | 25 | GL18 | 45 | GL18 | 25 | GL18 | 45 | GL18 | 25 | GL18 | 45 | |
| Analyte, ug/L | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1.0 U | | 1.0 U |
| 1,1-Dichloroethane | 1.0 U | | 1.0 U |
| 1,1-Dichloroethene | 1.0 U | | 1.0 U |
| 1,2-Dichloroethane | 1.0 U | | 1.0 U |
| Benzene | 34 | | 22 | | 5.7 | | 1.4 | | 2 | | 1.0 U | | 1.0 U |
| Carbon tetrachloride | 1.0 U | | 1.0 U |
| Chlorobenzene | 1.0 U | | 1.0 U |
| cis-1,2-Dichloroethene | 1.0 U | | 1.0 U |
| Ethylbenzene | 1.8 | | 1.0 U | | 1.0 U |
| m,p-Xylene | 11 | | 1.0 U | | 1.0 U |
| Methylene chloride | 2.3 | | 3.2 | | 1.0 U | | 1.0 U |
| Naphthalene | 160 | | 12 | | 7.8 | | 1.0 U | | 4.5 | | 1.0 U | | 1.0 U |
| o-Xylene | 9.8 | | 1.3 | | 1.0 U | | 1.0 U |
| Tetrachloroethene | 1.0 U | | 1.0 U |
| Toluene | 14 | | 3.1 | | 1.1 | | 1.0 U | | 0.8 J | | 1.0 U | | 1.0 U |
| trans-1,2-Dichloroethene | 1.0 U | | 1.0 U |
| Trichloroethene | 1.0 U | | 0.8 J |
| Vinyl chloride | 1.0 U | | 1.0 U |

Table 2-2
Summary of Iosflow Sample Results
Volatile Organics - Fall 2002
Nature and Extent Investigation
ISG Sparrows Point, Inc.

| Analyte, ug/L | Sample ID | HI08-RS-65 |
|--------------------------|-----------|------------|
| | Location | HI08 |
| | Depth | 65 |
| 1,1,1-Trichloroethane | | 1.0 U |
| 1,1-Dichloroethane | | 1.0 U |
| 1,1-Dichloroethene | | 1.0 U |
| 1,2-Dichloroethane | | 1.0 U |
| Benzene | | 1.0 U |
| Carbon tetrachloride | | 1.0 U |
| Chlorobenzene | | 1.0 U |
| cis-1,2-Dichloroethene | | 1.0 U |
| Ethylbenzene | | 1.0 U |
| m,p-Xylene | | 1.0 U |
| Methylene chloride | | 1.0 U |
| Naphthalene | | 1.0 U |
| o-Xylene | | 1.0 U |
| Tetrachloroethene | | 1.0 U |
| Toluene | | 1.0 U |
| trans-1,2-Dichloroethene | | 1.0 U |
| Trichloroethene | | 1.0 U |
| Vinyl chloride | | 1.0 U |

**Table 2-3
Summary of Piezometric Survey Data and
Water Level Measurements
Nature and Extent Activities
Sparrows Point, Maryland**

| Well ID | Corrected Well ID | Eastings | Northings | MP Elev NAVD 88 | Depth to Water, ft (12- 03) | Water Elev (12-03) | Depth to Water, ft (06- 04) | Water Elev (06-04) |
|-------------------|-------------------|-------------|-------------|--------------------|-----------------------------------|-----------------------|-----------------------------------|-----------------------|
| CO02-PZM006 | CO02-PZM006 | 1455306.538 | 562580.279 | 13.89 | 11.96 | 1.93 | 11.91 | 1.98 |
| CO02-PZM041 | CO02-PZM041 | 1455309.101 | 562569.38 | 13.88 | 14.04 | -0.16 | 13.43 | 0.45 |
| CO03-PZM005 | CO03-PZM005 | 1455398.333 | 562990.712 | 13.53 | NM | | NM | |
| CO04-PZM004 | CO04-PZM004 | 1456891.794 | 562778.699 | 12.3 | 6.35 | 5.95 | 7.61 | 4.69 |
| CO04-PZM048 | CO04-PZM048 | 1456893.542 | 562773.1 | 12.27 | 12.25 | 0.02 | 10.92 | 1.35 |
| CO06-PZM008 | CO06-PZM008 | 1457990.758 | 562941.284 | 9.67 | 7.66 | 2.01 | NM | |
| CO06-PZM039 | CO06-PZM039 | 1457978.349 | 562944.097 | 9.13 | 9.18 | -0.05 | NM | |
| CO07-PZM008 | CO07-PZM008 | 1455535.775 | 562166.005 | 13.74 | 11.95 | 1.79 | 11.91 | 1.83 |
| CO07-PZM050 | CO07-PZM050 | 1455543.93 | 562168.926 | 13.48 | 13.69 | -0.21 | 13.09 | 0.39 |
| CO08-PZM005 | CO08-PZM005 | 1456380.16 | 562225.06 | 11.68 | 8.99 | 2.69 | 2.1 | 9.58 |
| CO08-PZM036 | CO08-PZM036 | 1456375.341 | 562223.329 | 11.53 | 11.25 | 0.28 | 10.9 | 0.63 |
| CO08-PZM098 | CO08-PZM098 | 1456377.474 | 562227.522 | 11.6 | NM | | NM | |
| CO09-PZM007 | CO09-PZM007 | 1457052.234 | 562277.726 | 11.15 | 9.38 | 1.77 | NM | |
| CO10-PZM006 | CO10-PZM006 | 1457804.988 | 562369.267 | 11.423 | 10.14 | 1.28 | 7.99 | 3.43 |
| CO10-PZM029 | CO10-PZM029 | 1457804.976 | 562345.148 | 11.18 | 10.75 | 0.43 | 9.85 | 1.33 |
| CO10-PZM090 | CO10-PZM090 | 1457808.442 | 562350.627 | 10.96 | 10.14 | 0.82 | 9.91 | 1.05 |
| CO13-PZM008 | CO13-PZM008 | 1457359.075 | 561640.003 | 12.01 | 10.48 | 1.53 | 10.34 | 1.67 |
| CO13-PZM030 | CO13-PZM030 | 1457354.356 | 561632.236 | 12.15 | 12.15 | 0.00 | 11.63 | 0.52 |
| CO25-PZM008 | CO25-PZM008 | 1457594.221 | 561811.334 | 12.03 | NM | | 10.41 | |
| CO25-PZM008 | CO25-PZM008 | 1457594.221 | 561811.334 | 12.03 | 10.56 | 1.47 | NM | |
| CO26-PZM007 | CO26-PZM007 | 1458048.048 | 561682.425 | 12.76 | 11.49 | 1.27 | 11.3 | 1.46 |
| CO26-deep | CO26-PZM032 | 1458037.905 | 561688.4174 | 14.987 | 15.49 | -0.50 | 14.61 | 0.38 |
| CO27-shallow | CO27-PZM012 | 1454916.917 | 563239.9654 | 5.12 | 4.83 | 0.29 | 4.2 | 0.92 |
| CO27-intermediate | CO27-PZM046 | 1454913.372 | 563239.9578 | 5.17 | 6.39 | -1.22 | 5.67 | -0.50 |
| CO27-deep | CO27-PZM122 | 1454920.002 | 563241.7637 | 5.38 | 7.18 | -1.80 | 6.35 | -0.97 |
| CO28-shallow | CO28-PZM010 | 1454280.619 | 562891.9273 | 12.34 | 12.12 | 0.22 | 11.25 | 1.09 |
| CO28-intermediate | CO28-PZM048 | 1454283.654 | 562888.7575 | 12.69 | 12.79 | -0.10 | 11.79 | 0.90 |
| CO28-deep | CO28-PZM125 | 1454287.143 | 562888.2252 | 12.64 | 14.58 | -1.94 | 13.61 | -0.97 |
| CO29-shallow | CO29-PZM010 | 1453850.899 | 562130.6067 | 14.86 | 15.31 | -0.45 | 14.58 | 0.28 |
| CO29-deep | CO29-PZM051 | 1453832.124 | 562122.8928 | 13.48 | 14.09 | -0.61 | 11.55 | 1.93 |
| CO30-shallow | CO30-PZM015 | 1454556.547 | 561657.0572 | 12.35 | 12.46 | -0.11 | 11.41 | 0.94 |
| CO30-deep | CO30-PZM060 | 1454552.775 | 561656.7772 | 13.36 | 13.94 | -0.58 | 13.15 | 0.21 |
| CO32-shallow | CO32-PZM041 | 1455277.057 | 561634.5945 | 13.15 | 13.23 | -0.08 | 9.67 | 3.48 |
| CO33-deep | CO33-PZM141 | 1455149.499 | 562413.619 | 13.82 | 15.72 | -1.90 | 14.87 | -1.05 |
| CO34 | CO34-PZM048 | 1457149.738 | 561895.7864 | 0 | 14.35 | -14.35 | NM | |
| CO35-shallow | CO35-PZM013 | 1458160.797 | 560858.8195 | 11.06 | 10.49 | 0.57 | 9.99 | 1.07 |
| CO35-deep | CO35-PZM056 | 1458160.714 | 560861.8298 | 11.261 | 11.58 | -0.32 | 11.03 | 0.23 |
| CP02-PZM007 | CP02-PZM007 | 1456414.079 | 560865.993 | 27.12 | 25.96 | 1.16 | 25.69 | 1.43 |
| CP02-PZM026 | CP02-PZM026 | 1456402.74 | 560881.5 | 27.31 | 26.67 | 0.64 | 26.25 | 1.06 |
| CP03-PZM008 | CP03-PZM008 | 1455887.674 | 560856.675 | 30.39 | 29.61 | 0.78 | 29.13 | 1.26 |
| CP03-PZM025 | CP03-PZM025 | 1455882.794 | 560856.315 | 30.1 | 29.90 | 0.20 | 29.4 | 0.70 |
| CP05-PZM008 | CP05-PZM008 | 1454932.295 | 560044.5062 | 9.752 | 10.26 | -0.51 | 8.94 | 0.81 |
| CP05-PZM019 | CP05-PZM019 | 1454939.126 | 560034.225 | 10.48 | 10.97 | -0.49 | 9.69 | 0.79 |
| CP05-PZM028 | CP05-PZM028 | 1454920.879 | 560050.934 | 7.07 | 7.55 | -0.48 | 6.3 | 0.77 |
| CP05-deep | CP05-PZM128 | 1454931.526 | 560034.4488 | 7.138 | 9.11 | -1.97 | 8.1 | -0.96 |
| CP06-PZM009 | CP06-PZM009 | 1455539.143 | 560219.462 | 57.14 | 57.46 | -0.32 | 56.96 | 0.18 |
| CP07-PZM006 | CP07-PZM006 | 1456130.9 | 560493.407 | 14 | 13.55 | 0.45 | 13 | 1.00 |
| CP07-PZM018 | CP07-PZM018 | 1456137.708 | 560485.188 | 10.45 | 10.25 | 0.20 | NM | |
| CP07-PZM026 | CP07-PZM026 | 1456137.671 | 560493.275 | 10.69 | 10.35 | 0.34 | NM | |

**Table 2-3
Summary of Piezometric Survey Data and
Water Level Measurements
Nature and Extent Activities
Sparrows Point, Maryland**

| Well ID | Corrected Well ID | Eastings | Northings | MP Elev NAVD 88 | Depth to Water, ft (12- 03) | Water Elev (12-03) | Depth to Water, ft (06- 04) | Water Elev (06-04) |
|--------------|-------------------|-------------|-------------|--------------------|-----------------------------------|-----------------------|-----------------------------------|-----------------------|
| CP08-PZM008 | CP08-PZM008 | 1456698.421 | 560456.819 | 24.64 | 23.75 | 0.89 | 23.45 | 1.19 |
| CP08-PZM034 | CP08-PZM034 | 1456697.459 | 560464.899 | 25.47 | 25.32 | 0.15 | 25.02 | 0.45 |
| CP09-PZM010 | CP09-PZM010 | 1455332.044 | 559498.846 | 7.63 | 7.99 | -0.36 | 6.75 | 0.88 |
| CP09-PZM047 | CP09-PZM047 | 1455336.345 | 559498.516 | 7.39 | 7.82 | -0.43 | 6.59 | 0.80 |
| CP11-PZM010 | CP11-PZM010 | 1456177.229 | 559357.464 | 8.43 | 8.92 | -0.49 | 7.68 | 0.75 |
| CP11-PZM040 | CP11-PZM040 | 1456183.825 | 559363.701 | 7.64 | 8.21 | -0.57 | 6.94 | 0.70 |
| CP12-PZM012 | CP12-PZM012 | 1456306.57 | 559903.579 | 5.35 | 5.56 | -0.21 | 4.44 | 0.91 |
| CP12-PZM052 | CP12-PZM052 | 1456313.747 | 559905.178 | 4.71 | 4.79 | -0.08 | 4.23 | 0.48 |
| CP14-PZM009 | CP14-PZM009 | 1457257.14 | 559826.416 | 13.06 | 13.09 | -0.03 | 12.09 | 0.97 |
| CP14-PZM062 | CP14-PZM062 | 1457250.141 | 559816.392 | 13.67 | 14.23 | -0.56 | 13.51 | 0.16 |
| CP15-shallow | CP15-PZM020 | 1455789.362 | 559446.9644 | 7.08 | 7.51 | -0.43 | 6.28 | 0.80 |
| CP15-deep | CP15-PZM042 | 1455792.819 | 559446.0522 | 7.98 | 8.35 | -0.37 | 7.1 | 0.88 |
| CP16-shallow | CP16-PZM018 | 1456804.99 | 559875.3801 | 20.31 | 20.32 | -0.01 | 19.38 | 0.93 |
| CP16-deep | CP16-PZM035 | 1456808.801 | 559874.1854 | 20.01 | 20.02 | -0.01 | 19.09 | 0.92 |
| CP17-shallow | CP17-PZM013 | 1458108.933 | 560365.5371 | 9.061 | 8.84 | 0.22 | 8.02 | 1.04 |
| CP17-deep | CP17-PZM058 | 1458108.487 | 560362.4573 | 9.778 | 10.03 | -0.25 | 10.49 | -0.71 |
| FM01-PZM003 | FM01-PZM003 | 1460279.365 | 568252.054 | 10.11 | 3.40 | 6.71 | 3.5 | 6.61 |
| FM01-PZM041 | FM01-PZM041 | 1460275.595 | 568251.833 | 9.97 | 10.34 | -0.37 | 10.28 | -0.31 |
| FM02-PZM002 | FM02-PZM002 | 1461163.825 | 569903.755 | 11.51 | 5.20 | 6.31 | 4.95 | 6.56 |
| FM02-PZM033 | FM02-PZM033 | 1461163.124 | 569914.266 | 11.32 | 11.76 | -0.44 | 11.52 | -0.20 |
| FM03-PZM005 | FM03-PZM005 | 1460998.218 | 568823.6114 | 1.935 | 5.90 | -3.97 | 5.75 | -3.82 |
| FM03-PZM026 | FM03-PZM026 | 1460998.895 | 568828.557 | 11.93 | NM | | 8.92 | 3.01 |
| FM03-deep | FM03-PZM082 | 1461001.892 | 568826.6952 | | 12.32 | | 12.2 | |
| FM04-PZM009 | FM04-PZM009 | 1461937.982 | 570122.421 | 11.46 | 5.56 | 5.90 | 5.24 | 6.22 |
| FM04-PZM036 | FM04-PZM036 | 1461933.312 | 570122 | 11.8 | 12.25 | -0.45 | 12.15 | -0.35 |
| FM04-PZM054 | FM04-PZM054 | 1461928.165 | 570121.554 | 11.83 | 11.71 | 0.12 | 12.05 | -0.22 |
| FM05-PZM004 | FM05-PZM004 | 1462039.327 | 568569.755 | 9.3 | 4.27 | 5.03 | 4.55 | 4.75 |
| FM05-PZM024 | FM05-PZM024 | 1462039.291 | 568564.617 | 9.53 | 6.58 | 2.95 | 6.7 | 2.83 |
| GL02-PZM006 | GL02-PZM006 | 1457638.339 | 574640.696 | 20.01 | 18.05 | 1.96 | 19.39 | 0.62 |
| GL02-PZM017 | GL02-PZM017 | 1457632.579 | 574609.95 | 20.59 | 21.04 | -0.45 | 20.85 | -0.26 |
| GL02-PZM028 | GL02-PZM028 | 1457626.162 | 574607.249 | 20.31 | 21.02 | -0.71 | 20.73 | -0.42 |
| GL03-PZM013 | GL03-PZM013 | 1459228.629 | 574549.103 | 17.29 | 12.89 | 4.40 | 12.78 | 4.51 |
| GL03-PZP001 | GL03-PZP001 | 1459231.96 | 574558.448 | 17.23 | 5.00 | 12.23 | 5.12 | 12.11 |
| GL04-PZM026 | GL04-PZM026 | 1460119.899 | 574366.218 | 13.21 | 10.43 | 2.78 | 12 | 1.21 |
| GL04-PZM046 | GL04-PZM046 | 1460117.542 | 574360.851 | 13.31 | 1.82 | 11.49 | 2.34 | 10.97 |
| GL04-PZP001 | GL04-PZP001 | 1460128.107 | 574364.105 | 16.51 | 3.55 | 12.96 | 4.78 | 11.73 |
| GL05-PZM008 | GL05-PZM008 | 1457011.527 | 574242.321 | 22.43 | 21.53 | 0.90 | 21.03 | 1.40 |
| GL05-PZM020 | GL05-PZM020 | 1457015.685 | 574240.52 | 22.78 | 23.77 | -0.99 | 22.01 | 0.77 |
| GL08-PZM000 | GL08-PZM000 | 1459105.236 | 573874.537 | 17.11 | 4.04 | 13.07 | 4.21 | 12.90 |
| GL08-PZM036 | GL08-PZM036 | 1459193.495 | 573916.439 | 17.45 | 17.50 | -0.05 | 16.93 | 0.52 |
| GL09-PZM016 | GL09-PZM016 | 1459792.645 | 573420.125 | 15.91 | 9.95 | 5.96 | 9.67 | 6.24 |
| GL09-PZP001 | GL09-PZP001 | 1459785.816 | 573428.971 | 16.04 | 3.85 | 12.19 | 3.94 | 12.10 |
| GL10-PZM012 | GL10-PZM012 | 1457193.288 | 573434.619 | 19.51 | 19.42 | 0.09 | 19.67 | -0.16 |
| GL10-PZP003 | GL10-PZP003 | 1457205.459 | 573431.092 | 19.44 | 14.26 | 5.18 | 13.85 | 5.59 |
| GL11-PZM030 | GL11-PZM030 | 1458899.527 | 573117.65 | 18.47 | NM | | 18.25 | 0.22 |
| GL11-PZP002 | GL11-PZP002 | 1458877.003 | 573173.129 | 16.46 | NM | | 4.83 | 11.63 |
| GL13-PZM012 | GL13-PZM012 | 1457701.444 | 573321.096 | 23.29 | 14.67 | 8.62 | 13.98 | 9.31 |
| GL13-PZM032 | GL13-PZM032 | 1457701.444 | 573321.096 | 23.41 | 23.55 | -0.14 | 22.79 | 0.62 |
| GL13-PZP003 | GL13-PZP003 | 1457683.741 | 573324.081 | 23.15 | 9.63 | 13.52 | 9.54 | 13.61 |
| GL14-PZM010 | GL14-PZM010 | 1457035.142 | 573879.288 | 25.34 | NM | | 22.39 | 2.95 |

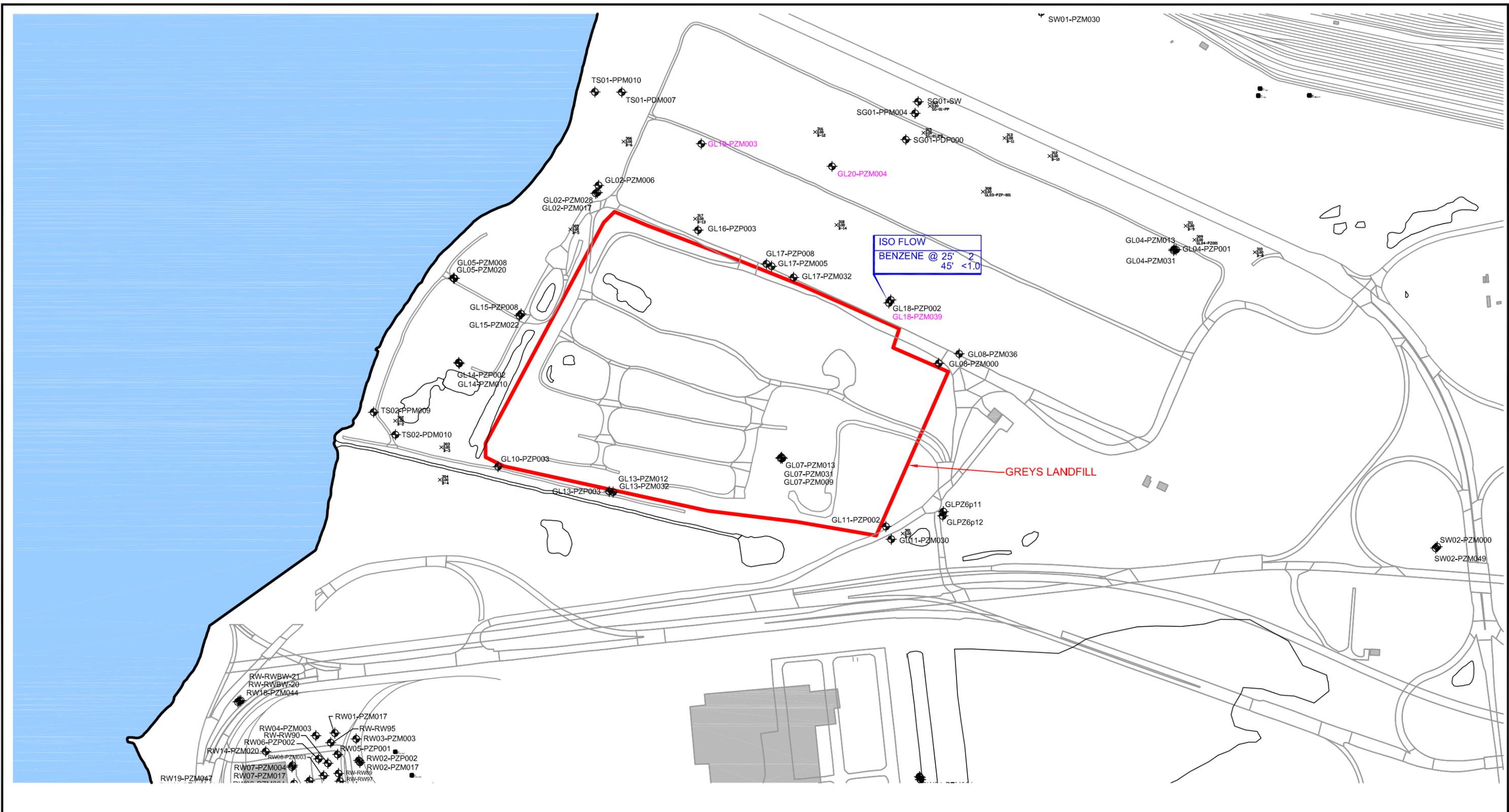
**Table 2-3
Summary of Piezometric Survey Data and
Water Level Measurements
Nature and Extent Activities
Sparrows Point, Maryland**

| Well ID | Corrected Well ID | Eastings | Northings | MP Elev NAVD 88 | Depth to Water, ft (12- 03) | Water Elev (12-03) | Depth to Water, ft (06- 04) | Water Elev (06-04) |
|--------------|-------------------|-------------|-------------|--------------------|-----------------------------------|-----------------------|-----------------------------------|-----------------------|
| GL14-PZP002 | GL14-PZP002 | 1457036.938 | 573873.508 | 24.36 | NM | | 16.05 | 8.31 |
| GL15-PZM022 | GL15-PZM022 | 1457296.606 | 574080.334 | 25.79 | 25.47 | 0.32 | 20.39 | 5.40 |
| GL15-PZP008 | GL15-PZP008 | 1457304.262 | 574087.975 | 24.78 | 12.83 | 11.95 | 11.85 | 12.93 |
| GL17-PZM005 | GL17-PZM005 | 1458383.579 | 574293.399 | 22.48 | 8.49 | 13.99 | 10.13 | 12.35 |
| GL17-PZM020 | GL17-PZM020 | 1458480 | 574243 | 22.15 | 14.58 | 7.57 | 16.43 | 5.72 |
| GL17-PZM032 | GL17-PZM032 | 1458479.088 | 574244.772 | 22.14 | 22.35 | -0.21 | 22.33 | -0.19 |
| GL17-PZP008 | GL17-PZP008 | 1458362.263 | 574302.974 | 21.94 | 9.41 | 12.53 | 9.47 | 12.47 |
| GL18-deep | GL18-PZM039 | 1458898.444 | 574148.2921 | 18.566 | 18.62 | -0.05 | 19.22 | -0.65 |
| GL18-PZM002 | GL18-PZM002 | 1458889.982 | 574135.0695 | 18.786 | 5.88 | 12.91 | 5.33 | 13.46 |
| GL19-shallow | GL19-PZM003 | 1458080.649 | 574820.3502 | 20.39 | 14.31 | 6.08 | 11.41 | 8.98 |
| GL20-shallow | GL20-PZM004 | 1458643.411 | 574724.3434 | 19.44 | 11.80 | 7.64 | 9.83 | 9.61 |
| HI01-PZM009 | HI01-PZM009 | 1456398.529 | 569840.877 | 10.38 | 8.14 | 2.24 | 8.34 | 2.04 |
| HI01-PZM035 | HI01-PZM035 | 1456401.059 | 569832.722 | 10.68 | 11.21 | -0.53 | 10.67 | 0.01 |
| HI01-PZM056 | HI01-PZM056 | 1456398.878 | 569836.975 | 10.73 | 11.17 | -0.44 | 10.79 | -0.06 |
| HI02-PZM006 | HI02-PZM006 | 1457454.196 | 569967.118 | 10.68 | 6.38 | 4.30 | 6.99 | 3.69 |
| HI02-PZM032 | HI02-PZM032 | 1457459.522 | 569963.695 | 10.71 | 6.42 | 4.29 | 5.35 | 5.36 |
| HI04-PZM006 | HI04-PZM006 | 1459049.3 | 570781.941 | 12.4 | 9.27 | 3.13 | 9.36 | 3.04 |
| HI04-PZM034 | HI04-PZM034 | 1459048.258 | 570791.668 | 13.5 | 13.85 | -0.35 | 13.57 | -0.07 |
| HI06-PZM002 | HI06-PZM002 | 1460246.12 | 571975.667 | 13.09 | NM | | NM | |
| HI06-PZM058 | HI06-PZM058 | 1460249.569 | 571977.495 | 13.72 | NM | | NM | |
| HI07-PZM005 | HI07-PZM005 | 1458394 | 570178 | 12.69 | 8.75 | 3.94 | 9.05 | 3.64 |
| HI07-PZM032 | HI07-PZM032 | 1458394 | 570178 | 11.58 | 11.73 | -0.15 | 11.25 | 0.33 |
| HI07-deep | HI07-PZM094 | 1458421.756 | 570205.4421 | 11.61 | 11.92 | -0.31 | 12.29 | -0.68 |
| HI08-deep | HI08-PZM060 | 1456724.554 | 569390.4937 | 13.115 | 13.64 | -0.53 | 14.04 | -0.92 |
| SG07-PDM008 | SG07-PDM008 | 1463980.458 | 564025.648 | 17.95 | NM | | NM | |
| SG07-PPM008 | SG07-PPM008 | 1463968.739 | 564183.442 | 14.9 | NM | | NM | |
| SG07-PZM007 | SG07-PZM007 | 1463674.708 | 564148.494 | 14.7 | NM | | NM | |
| SW01-PZM004 | SW01-PZM004 | 1459538.367 | 575394.441 | 24 | 17.79 | 6.21 | 18.28 | 5.72 |
| SW01-PZM030 | SW01-PZM030 | 1459546.957 | 575386.814 | 24.2 | 24.40 | -0.20 | 23.66 | 0.54 |
| SW02-PZM000 | SW02-PZM000 | 1461248.173 | 573080.468 | 17.73 | 8.76 | 8.97 | 9.68 | 8.05 |
| SW02-PZM049 | SW02-PZM049 | 1461254.251 | 573086.194 | 17.58 | 10.83 | 6.75 | 11.54 | 6.04 |
| SW03-PZM003 | SW03-PZM003 | 1456735.365 | 571205.695 | 14.55 | 4.48 | 10.07 | 4.91 | 9.64 |
| SW03-PZM060 | SW03-PZM060 | 1456738.467 | 571201.562 | 14.93 | 15.35 | -0.42 | 15.13 | -0.20 |
| SW04-PZM001 | SW04-PZM001 | 1459022.373 | 572096.753 | 11.93 | 2.64 | 9.29 | 2.49 | 9.44 |
| SW04-PZM030 | SW04-PZM030 | 1459025.707 | 572083.871 | 11.94 | 12.13 | -0.19 | 12.03 | -0.09 |
| SW04-PZM056 | SW04-PZM056 | 1459024.507 | 572091.849 | 12.05 | 12.38 | -0.33 | 11.97 | 0.08 |
| SW05-PZM004 | SW05-PZM004 | 1464959.571 | 572248.055 | 16.5 | 8.55 | 7.95 | 10.05 | 6.45 |
| SW05-PZM039 | SW05-PZM039 | 1464952.585 | 572255.254 | 18.14 | 16.01 | 2.13 | 16.22 | 1.92 |
| SW06-PZM001 | SW06-PZM001 | 1463626.61 | 569204.398 | 17.51 | 4.71 | 12.80 | 7.28 | 10.23 |
| SW06-PZM053 | SW06-PZM053 | 1463631.605 | 569204.261 | 17.44 | 17.69 | -0.25 | DRY | |
| SW07-PZM004 | SW07-PZM004 | 1456050.022 | 567658.832 | 14.58 | 11.26 | 3.32 | 11.46 | 3.12 |
| SW07-PZM108 | SW07-PZM108 | 1456049.01 | 567665.21 | 14.75 | 16.21 | -1.46 | 15.72 | -0.97 |
| SW08-PZM003 | SW08-PZM003 | 1459112.156 | 568112.127 | 8.49 | 0.50 | 7.99 | NM | |
| SW08-PZM053 | SW08-PZM053 | 1459113.28 | 568107.673 | 8.7 | 8.11 | 0.59 | NM | |
| SW09-PZM004 | SW09-PZM004 | 1460293.513 | 566975.141 | 13.21 | 3.21 | 10.00 | 3.84 | 9.37 |
| SW09-PZM028 | SW09-PZM028 | 1460287.924 | 566975.977 | 13.14 | 8.20 | 4.94 | 8.56 | 4.58 |
| SW09-PZM068 | SW09-PZM068 | 1460290.85 | 566970.991 | 13.36 | 3.70 | 9.66 | 4.12 | 9.24 |
| SW10-PZM012 | SW10-PZM012 | 1463288.221 | 567312.891 | 7.82 | 4.12 | 3.70 | 5.01 | 2.81 |
| SW10-PZM085 | SW10-PZM085 | 1463311.377 | 567286.887 | 7.69 | 7.87 | -0.18 | 8.02 | -0.33 |
| SW11-PZM005 | SW11-PZM005 | 1456075.911 | 565800.944 | 10.79 | 3.19 | 7.60 | 3.66 | 7.13 |

**Table 2-3
Summary of Piezometric Survey Data and
Water Level Measurements
Nature and Extent Activities
Sparrows Point, Maryland**

| Well ID | Corrected Well ID | Eastings | Northings | MP Elev NAVD 88 | Depth to Water, ft (12- 03) | Water Elev (12-03) | Depth to Water, ft (06- 04) | Water Elev (06-04) |
|-------------|-------------------|-------------|-------------|--------------------|-----------------------------------|-----------------------|-----------------------------------|-----------------------|
| SW11-PZM092 | SW11-PZM092 | 1456083.477 | 565801.436 | 10.71 | 12.15 | -1.44 | 11.56 | -0.85 |
| SW12-PZM100 | SW12-PZM100 | 1457431.31 | 565989.874 | 17.9 | 19.45 | -1.55 | 18.95 | -1.05 |
| SW12-PZP001 | SW12-PZP001 | 1457437.268 | 565991.29 | 18.34 | 10.85 | 7.49 | 11.12 | 7.22 |
| SW13-PZM003 | SW13-PZM003 | 1456410.803 | 563496.415 | 15.753 | 9.54 | 6.21 | 9.81 | 5.94 |
| SW13-PZM025 | SW13-PZM025 | 1456410.606 | 563498.818 | 15.59 | 16.14 | -0.55 | 15.81 | -0.22 |
| SW13-PZM111 | SW13-PZM111 | 1456409.706 | 563502.98 | 15.33 | 17.13 | -1.80 | 16.52 | -1.19 |
| SW14-PZM004 | SW14-PZM004 | 1457679.013 | 563388.178 | 13.87 | 5.24 | 8.63 | 5.61 | 8.26 |
| SW14-PZM099 | SW14-PZM099 | 1457671.2 | 563386.52 | 13.69 | 15.44 | -1.75 | 14.9 | -1.21 |
| SW15-PZM005 | SW15-PZM005 | 1459534.073 | 564367.598 | 14.84 | 4.99 | 9.85 | 5.34 | 9.50 |
| SW15-PZM031 | SW15-PZM031 | 1459531.619 | 564372.669 | 15.03 | 13.40 | 1.63 | 13.12 | 1.91 |
| SW15-PZM085 | SW15-PZM085 | 1459539.351 | 564367.461 | 14.33 | 15.96 | -1.63 | 15.5 | -1.17 |
| SW16-PZM003 | SW16-PZM003 | 1462434.666 | 564524.689 | 15.08 | 4.60 | 10.48 | 5.44 | 9.64 |
| SW16-PZM067 | SW16-PZM067 | 1462441.872 | 564528.79 | 15.42 | 17.01 | -1.59 | NM | |
| SW17-PZM007 | SW17-PZM007 | 1454504.257 | 562191.02 | 13.28 | 13.09 | 0.19 | 12.34 | 0.94 |
| SW17-PZM038 | SW17-PZM038 | 1454511.212 | 562190.2 | 13.6 | 13.46 | 0.14 | 12.41 | 1.19 |
| SW17-PZM113 | SW17-PZM113 | 1454508.128 | 562196.192 | 13.15 | 15.40 | -2.25 | 13.51 | -0.36 |
| SW18-PZM008 | SW18-PZM008 | 1457572.835 | 560776.453 | 13.36 | 12.29 | 1.07 | 11.99 | 1.37 |
| SW18-PZM053 | SW18-PZM053 | 1457590.882 | 560781.875 | 13.62 | 14.04 | -0.42 | 13.49 | 0.13 |
| SW18-PZM114 | SW18-PZM114 | 1457579.83 | 560782.578 | 13.56 | 13.04 | 0.52 | 12.55 | 1.01 |
| TM02-PZM009 | TM02-PZM009 | 1457354.115 | 569243.177 | 10.49 | 9.42 | 1.07 | 10.25 | 0.24 |
| TM02-PZM028 | TM02-PZM028 | 1457350.909 | 569236.251 | 10.43 | 9.37 | 1.06 | 10.23 | 0.20 |
| TM02-PZM062 | TM02-PZM062 | 1457346.88 | 569231.885 | 11.02 | 11.52 | -0.50 | 11.22 | -0.20 |
| TM03-PZM004 | TM03-PZM004 | 1457622.3 | 568855.1685 | 12.86 | 10.90 | 1.96 | 11.02 | 1.84 |
| TM03-PZM037 | TM03-PZM037 | 1457616.781 | 568850.5805 | 12.835 | 13.67 | -0.83 | 13.20 | -0.36 |
| TM04-PZM006 | TM04-PZM006 | 1458568.124 | 569438.272 | 12.44 | 11.94 | 0.50 | 12.88 | -0.44 |
| TM04-PZM028 | TM04-PZM028 | 1458581.113 | 569442.028 | 10.62 | 10.94 | -0.32 | 11.92 | -1.30 |
| TM04-PZM056 | TM04-PZM056 | 1458592.835 | 569445.542 | 13.71 | 14.14 | -0.43 | 13.95 | -0.24 |
| TM04-deep | TM04-PZM082 | 1458554.28 | 569432.8722 | 11.836 | 12.60 | -0.76 | 12.40 | -0.56 |
| TM05-PZM005 | TM05-PZM005 | 1458598.173 | 568852.343 | 13.44 | 11.89 | 1.55 | 11.16 | 2.28 |
| TM05-PZM069 | TM05-PZM069 | 1458593.769 | 568845.666 | 13.99 | 14.89 | -0.90 | 14.64 | -0.65 |
| TM06-PZM008 | TM06-PZM008 | 1459391.795 | 569583.574 | 13.75 | 12.90 | 0.85 | 13.40 | 0.35 |
| TM06-PZM034 | TM06-PZM034 | 1459387.639 | 569574.036 | 13.63 | 14.02 | -0.39 | 14.04 | -0.41 |
| TM07-PZM005 | TM07-PZM005 | 1459617.838 | 569431.352 | 13.81 | 12.94 | 0.87 | 13.10 | 0.71 |
| TM07-PZM045 | TM07-PZM045 | 1459629.916 | 569436.025 | 13.89 | 14.36 | -0.47 | 14.28 | -0.39 |
| TM08-PZM007 | TM08-PZM007 | 1459731.837 | 570380.989 | 9.75 | 9.01 | 0.74 | 9.22 | 0.53 |
| TM08-PZM038 | TM08-PZM038 | 1459724.514 | 570378.335 | 9.76 | 10.10 | -0.34 | 10.12 | -0.36 |
| TM09-PZM007 | TM09-PZM007 | 1459871.347 | 570392.44 | 11.28 | 10.62 | 0.66 | 11.05 | 0.23 |
| TM09-PZM047 | TM09-PZM047 | 1459878.227 | 570392.514 | 11.38 | 11.71 | -0.33 | 11.71 | -0.33 |
| TM09 DEEP | TM09-PZM067 | 1459862.851 | 570395.3748 | 9.553 | 9.78 | -0.23 | 9.82 | -0.27 |
| TM11-PZM007 | TM11-PZM007 | 1460049.391 | 571191.741 | 10.83 | 9.98 | 0.85 | NM | |
| TM11-PZM034 | TM11-PZM034 | 1460045.115 | 571186.935 | 11.01 | NM | | NM | |
| TM13-PZM007 | TM13-PZM007 | 1460915.49 | 571539.202 | 12.57 | 11.50 | 1.07 | 11.70 | 0.87 |
| TM13-PZM046 | TM13-PZM046 | 1460920.863 | 571540.613 | 12.34 | 10.26 | 2.08 | 12.08 | 0.26 |
| TM15-PZM007 | TM15-PZM007 | 1461800.376 | 571624.092 | 10.6 | 8.38 | 2.22 | 8.52 | 2.08 |
| TM15-PZM011 | TM15-PZM011 | 1461796.636 | 571632.374 | 10.1 | 7.79 | 2.31 | 7.98 | 2.12 |
| TM15-PZM031 | TM15-PZM031 | 1461814.873 | 571627.918 | 11.04 | 10.80 | 0.24 | 8.41 | 2.63 |
| TM15-PZM065 | TM15-PZM065 | 1461810.805 | 571634.355 | 11.35 | 11.24 | 0.11 | 11.02 | 0.33 |
| TS01-PDM007 | TS01-PDM007 | 1457737.526 | 575042.182 | 20.14 | NM | | NM | |
| TS01-PPM010 | TS01-PPM010 | 1457621.986 | 575043.236 | 18.06 | 17.33 | 0.73 | 17.53 | 0.53 |
| TS03-PPP003 | TS03-PPP003 | 1456590.038 | 569454.562 | 14.61 | 13.52 | 1.09 | 14.95 | -0.34 |
| TS05-PDM004 | TS05-PDM004 | 1455720.047 | 563226.615 | 11.26 | NM | | NM | |
| TS05-PPM007 | TS05-PPM007 | 1455700.088 | 563334.15 | 10.38 | 8.53 | 1.85 | 8.86 | 1.52 |

**SECTION TWO
FIGURES**

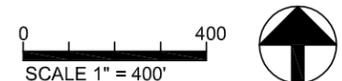


ISO FLOW
 BENZENE @ 25' < 2
 45' < 1.0

GREYS LANDFILL

LEGEND

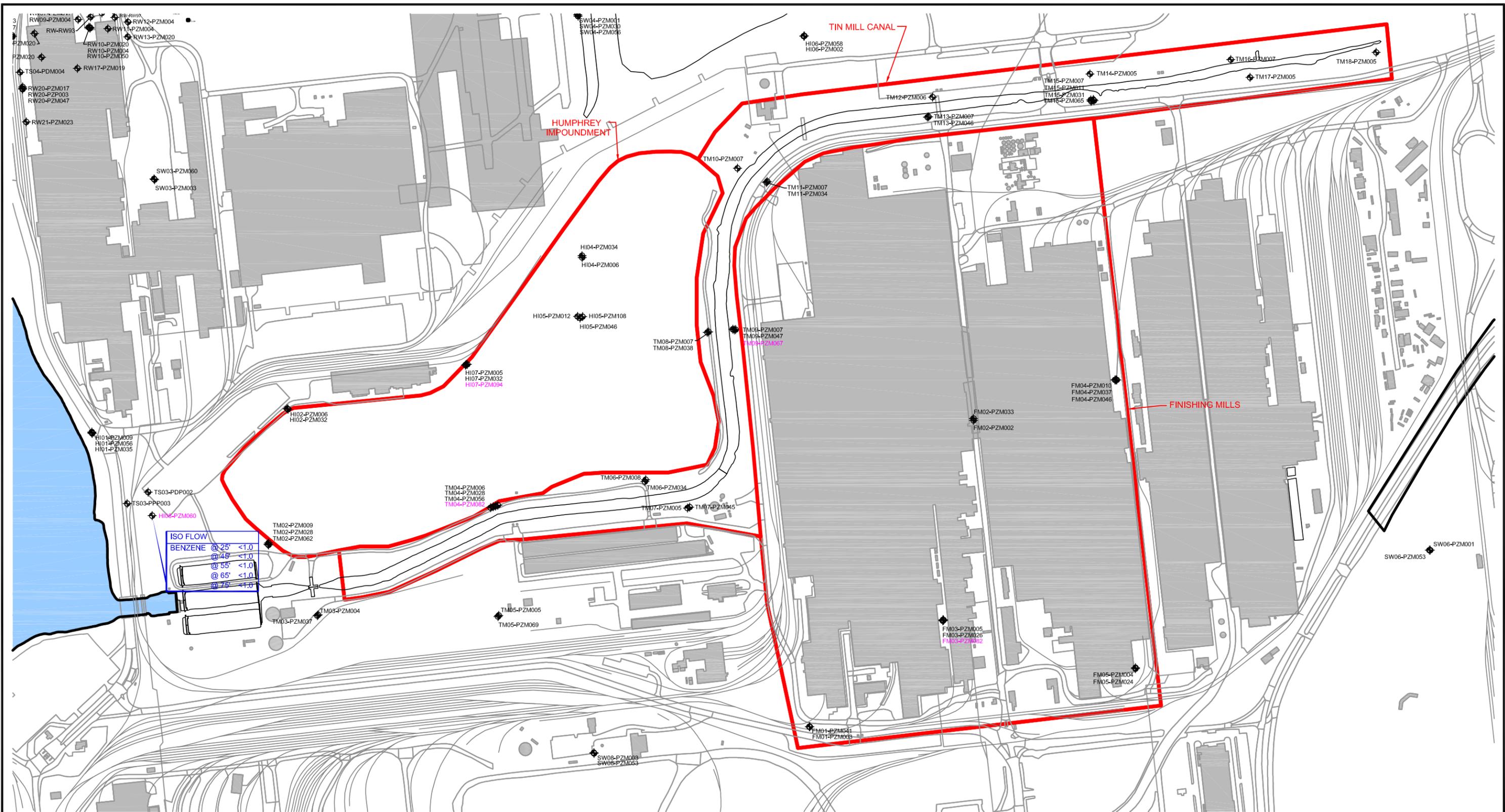
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- SWG03 Surface Water Gauge Was Installed During URS Extension Of Nature & Extent Study
- CO34-PZM048 Well Was Installed During Nature & Extent Study



ISG SPARROWS POINT, INC.

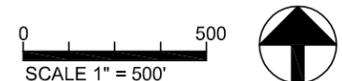
Figure 2-1
 Iso Flow ® Groundwater Data
 Benzene (ug/L)
 Greys Landfill

URS

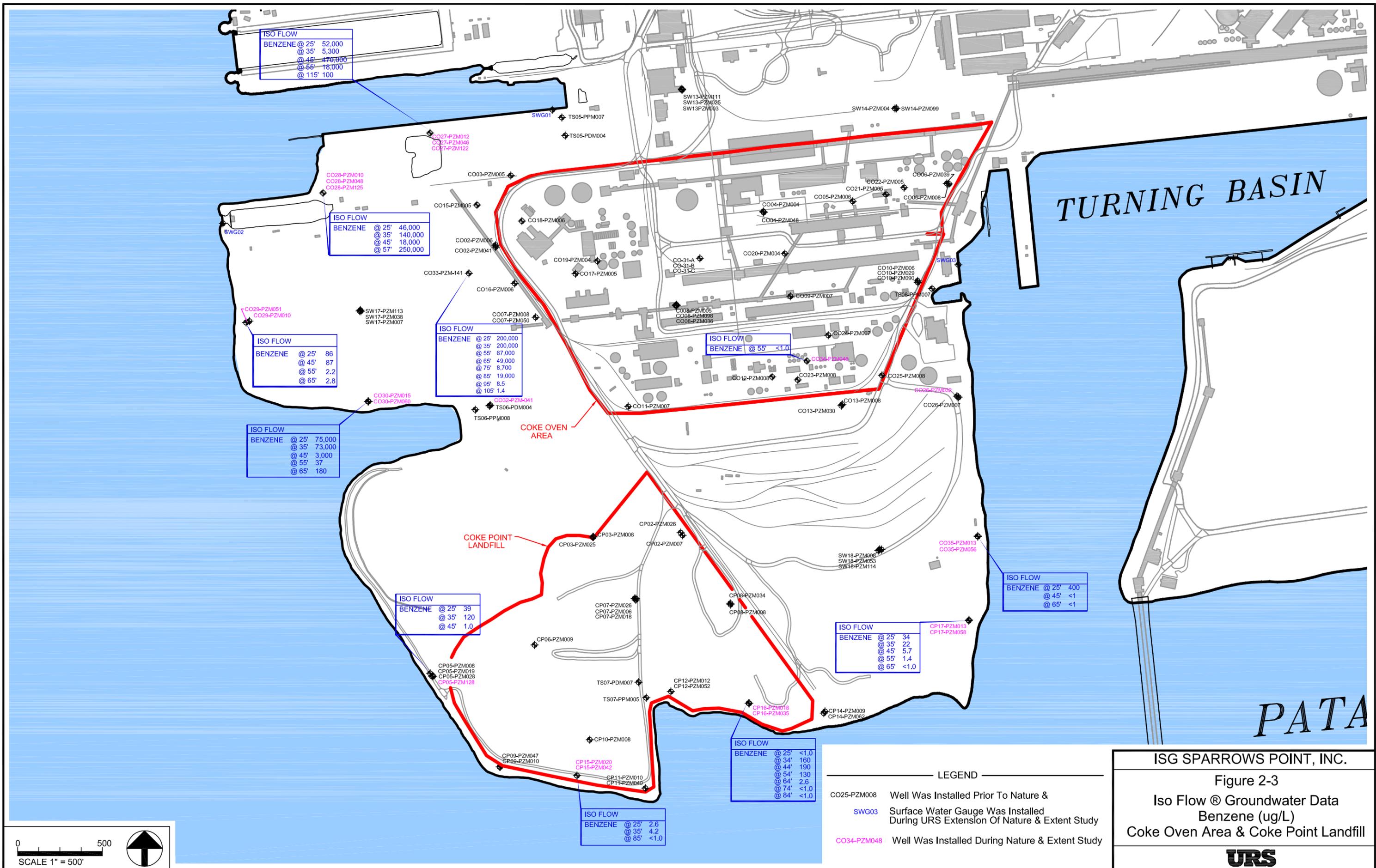


ISO FLOW
 BENZENE @ 25' <1.0
 @ 45' <1.0
 @ 65' <1.0
 @ 75' <1.0

- LEGEND
- CO25-PZM008 Well Was Installed Prior To Nature &
 - SWG03 Surface Water Gauge Was Installed During URS Extension Of Nature & Extent Study
 - CO34-PZM048 Well Was Installed During Nature & Extent Study



ISG SPARROWS POINT, INC.
 Figure 2-2
 Iso Flow ® Groundwater Data
 Benzene (ug/L)
 Humphrey Impoundment, Tin Mill Canal & Finishing Mills
 URS



ISO FLOW
BENZENE

| | |
|--------|---------|
| @ 25' | 52,000 |
| @ 35' | 5,300 |
| @ 45' | 470,000 |
| @ 55' | 18,000 |
| @ 115' | 100 |

ISO FLOW
BENZENE

| | |
|-------|---------|
| @ 25' | 46,000 |
| @ 35' | 140,000 |
| @ 45' | 18,000 |
| @ 57' | 250,000 |

ISO FLOW
BENZENE

| | |
|-------|-----|
| @ 25' | 86 |
| @ 45' | 87 |
| @ 55' | 2.2 |
| @ 65' | 2.8 |

ISO FLOW
BENZENE

| | |
|--------|---------|
| @ 25' | 200,000 |
| @ 35' | 200,000 |
| @ 55' | 67,000 |
| @ 65' | 49,000 |
| @ 75' | 8,700 |
| @ 85' | 19,000 |
| @ 95' | 8.5 |
| @ 105' | 1.4 |

ISO FLOW
BENZENE

| | |
|-------|--------|
| @ 25' | 75,000 |
| @ 35' | 73,000 |
| @ 45' | 3,000 |
| @ 55' | 37 |
| @ 65' | 180 |

ISO FLOW
BENZENE

| | |
|-------|------|
| @ 55' | <1.0 |
|-------|------|

ISO FLOW
BENZENE

| | |
|-------|-----|
| @ 25' | 400 |
| @ 45' | <1 |
| @ 65' | <1 |

ISO FLOW
BENZENE

| | |
|-------|-----|
| @ 25' | 39 |
| @ 35' | 120 |
| @ 45' | 1.0 |

ISO FLOW
BENZENE

| | |
|-------|------|
| @ 25' | 34 |
| @ 35' | 22 |
| @ 45' | 5.7 |
| @ 55' | 1.4 |
| @ 65' | <1.0 |

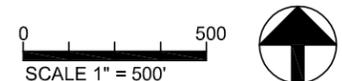
ISO FLOW
BENZENE

| | |
|-------|------|
| @ 25' | <1.0 |
| @ 34' | 160 |
| @ 44' | 190 |
| @ 54' | 130 |
| @ 64' | 2.6 |
| @ 74' | <1.0 |
| @ 84' | <1.0 |

ISO FLOW
BENZENE

| | |
|-------|------|
| @ 25' | 2.6 |
| @ 35' | 4.2 |
| @ 85' | <1.0 |

- LEGEND
- CO25-PZM008 Well Was Installed Prior To Nature &
 - SWG03 Surface Water Gauge Was Installed During URS Extension Of Nature & Extent Study
 - CO34-PZM048 Well Was Installed During Nature & Extent Study



ISG SPARROWS POINT, INC.

Figure 2-3
Iso Flow @ Groundwater Data
Benzene (ug/L)
Coke Oven Area & Coke Point Landfill

3.1 PHYSIOGRAPHY

The Sparrows Point Site is located within the Coastal Plain Physiographic Province (Coastal Plain). The Coastal Plain is a region of relatively low elevation and subdued topography, comprised of a wedge of unconsolidated sediments that thickens eastward. The eastern boundary of the Coastal Plain is the off-shore Continental Shelf within the Atlantic Ocean. The western boundary is the “fall line” which separates the Coastal Plain from the Piedmont Plateau located west of the Coastal Plain. The fall line often is coincident with the western limit of navigable waters and, thus, major cities such as Baltimore, Washington, D.C., Richmond, etc., are located near the fall line. (Bennett and Meyer, 1952; Ryan, 1953; and Crowley et al., 1971).

3.2 REGIONAL GEOLOGIC & HYDROGEOLOGIC CONDITIONS

3.2.1 Regional Geology

The crystalline Pre-Cambrian and early Paleozoic basement rocks are unconformably overlain by the Patuxent Formation, which is conformably overlain by the Arundel Formation. The Arundel Formation is disconformably overlain by the Patapsco Formation, which represents the uppermost Cretaceous sediments. Pleistocene sediments unconformably overlie the Cretaceous sediments (Chapelle, 1985). In places, recent deposits of natural and anthropogenic origin overlie the Pleistocene sediments.

Contemporary deposition of the sediments that comprise the Patuxent, Arundel and Patapsco Formations and down-warping of the basin in which these sediments were deposited resulted in these units dipping and thickening from west to east. These coastal plain sediments crop out along the fall line that trends northeast-southwest, and they dip to the southeast at about 80 feet per mile. A regional cross-section, presented on Figure 3-1, shows the thickening wedge of sediment developed from regional boring logs (Chapelle, 1985).

3.2.1.1 Pleistocene Formations

Quaternary sediments of Pleistocene age are present directly above the Cretaceous sediments of the Potomac Group, at thicknesses ranging from 0 to 150 feet (Bennett and Meyer, 1952; Chapelle, 1985; and Bachman and Wilson, 1984). The sand, gravel, and clay that comprise the Pleistocene sediments are divided into two generalized formations: upland deposits and lowland deposits. The upland deposits are generally mapped as the Brandywine, Sunderland, and Wicomico Formations. These deposits are not widespread and are present as thin caps on high ridges and hills. The lowland deposits are mostly mapped as the Talbot Formation and occur generally below an altitude of 50 feet. The lowland deposits are relatively widespread and are well exposed along the shore area of the Chesapeake Bay and its estuaries (Chapelle, 1985).

The Pleistocene sedimentary record indicates both marine and non-marine origins for the deposits in the Baltimore area. The lowland deposits of the Talbot Formation are interpreted to be related to the evolution of the Susquehanna River and the Chesapeake Bay. The thickness of the deposits indicates that the Susquehanna River eroded into the Patapsco Formation during the

Pleistocene. Marine sediments were then deposited during a glacially associated transgression of the sea (Bennett and Meyer, 1952). The thickness of the Talbot deposits (125 feet in the Sparrows Point area) may indicate an area of deeper paleo-channel erosion and subsequent backfill.

3.2.1.2 Patapsco Formation

The Patapsco Formation is the upper-most unit in the Potomac Group. In the Baltimore area, the Patapsco is comprised of interbedded sands, silts, and clays, and its thickness is reported to range from 0 to 200 feet (Chapelle, 1985). However, as discussed in Section 3.3.5, at the Sparrows Point Site, the Patapsco Formation has been interpreted to have a thickness of up to 255 feet. The finer-grained silt- and clay-size sediments comprise 40 to 60 percent of the formation. The remaining sand-size sediments are mostly quartz with trace amounts of feldspar and heavy minerals (Chapelle, 1985).

The Patapsco was also deposited under non-marine continental conditions. Individual fining upward beds 5 to 20 feet thick are common in outcrop. These fining upward units indicate that a meandering-stream depositional environment was present during the Patapsco sedimentation (Chapelle, 1985).

3.2.1.3 Arundel Formation

The Arundel Formation, or Arundel Clay, is the middle unit of the Potomac Group. In the Baltimore area it is a red to red-yellow, dense, plastic clay with thin lenses of silt. The composition of the clay is predominantly kaolinite and illite. The Arundel Clay is reported to range in thickness from 25 to 200 feet, and it thickens to the east and south (Chapelle, 1985). Figure 3-2 presents a thickness map of the Arundel showing the thickness of the formation in the Baltimore and Sparrows Point area (Chapelle 1985).

3.2.1.4 Patuxent Formation

The Patuxent Formation is the lowermost unit of the Potomac Group. The Patuxent sediments consist primarily of quartzose gravel and sand interbedded with silty clay lenses. The thickness is reported to range from 50 to 250 feet (Chapelle, 1985). At the Sparrows Point Site, the Patuxent Formation has been interpreted to have a thickness of about 320 feet. Figure 3-2 shows the outcrop and the top of the Patuxent Formation elevation.

3.2.1.5 Bedrock

Bedrock in the Baltimore area consists of Precambrian and/or Paleozoic metamorphic (gneiss and schist) and igneous intrusives (gabbro), collectively referred to as “basement” rocks (Chapelle, 1985). The basement rock surface forms a structure named the Salisbury Embayment, which is part of a larger basement structure called the Chesapeake-Delaware Embayment (Chapelle, 1985). The basement rocks in the Baltimore area outcrop west of the fall line and dip to the southeast with a slope of approximately 90 feet per mile (Bennett and Meyer, 1952).

3.2.2 Regional Hydrogeology

Aquifers in the Patuxent and Patapsco Formations are the primary groundwater sources in the Baltimore area. Local water supplies can be produced from the Talbot (i.e., Pleistocene) Formation. Where these formations outcrop proximate to estuaries, nearby water supply wells are susceptible to chloride contamination. No municipal water supply wells are located on the Sparrows Point peninsula.

3.2.2.1 Pleistocene Groundwater

Although uncommon, local supplies of groundwater can be developed in the Pleistocene lowland deposits of the Talbot Formation in the Baltimore area. Wide variations have been reported for the transmissivity of the water-bearing zones in the Talbot Formation in the Sparrows Point area. This variability is due to the discontinuous and lenticular nature of the water-bearing sand and gravel deposits caused by the interfingering of marine and fluvial facies within the Talbot Formation (Bennett and Meyer, 1952). Elevated chloride concentrations in the Talbot Formation are wide-spread along the Patapsco River and its estuaries, and salt-water encroachment is a significant factor limiting the development of water supplies in the Talbot Formation (Bennett and Meyer, 1952).

Groundwater recharge to the Talbot Formation occurs primarily through the percolation of local precipitation to the water table. Discharge is primarily by natural means to springs and surface waters of local rivers, streams, and estuaries.

3.2.2.2 Patapsco Aquifer

The Patapsco Formation is also a source of groundwater for the Baltimore area. A sand facies in the lower part of the Patapsco Formation is considered the principal source of water on the Patapsco aquifer. The Patapsco aquifer is predominantly unconfined in the Baltimore area because the formation outcrops or subcrops throughout much of the area and therefore has no upper confining bed. Where the Patapsco aquifer is confined (i.e., as at Sparrows Point), the overlying Pleistocene sediments serve as the upper confining bed, and the Arundel Formation is the lower confining bed. Vertical hydraulic conductivities for the Pleistocene sediments have been reported to range from 10^{-6} to 10^{-9} centimeters per second (cm/sec). In some parts of the Baltimore area, including the Sparrows Point Site, the Patapsco Formation contains a well defined “middle clay bed” that separates the lower sand facies from the upper part of the formation (Bennett and Meyer, 1952; and Chapelle 1985).

The Patapsco aquifer was used as a source of groundwater prior to 1900 and during the early part of the 20th century. Because the Patapsco aquifer widely subcrops beneath the brackish Patapsco River, elevated chloride concentrations became a major problem in areas near the Patapsco River estuary. By 1945, almost all water production from the Patapsco had ended due to excessive chloride near the Harbor, Canton, and Dundalk areas. The BSC plant was the only major user of the Patapsco aquifer in 1945. Water production totaled about 3 million gallons per day (Mgal/day); however, by the later 1940's and 1950's, many of the Sparrows Point wells were

affected by elevated levels of chlorides and were abandoned. As of 1985, there was no major use of the Patapsco aquifer in the immediate vicinity of the Patapsco River estuary.

The Patapsco aquifer is recharged through outcrop exposures of the Patapsco Formation to the northwest of the Sparrows Point area. In 1945, significant discharge occurred in the Sparrows Point area through water-well withdrawal. With the cessation of pumping since 1945, and the consequent recovery of water levels in the aquifer, discharge of water that infiltrates the Patapsco Formation northwest of the Sparrows Point area now occurs through subcrop exposures into the bay or estuaries.

3.2.2.3 Patuxent Aquifer

The Patuxent Formation is an additional significant source of groundwater for the Baltimore area. The most productive zone of the Patuxent Formation is the lower (older) braided-stream facies. The Arundel Formation is the upper confining bed of the Patuxent aquifer, and the crystalline bedrock generally acts as a lower confining bed (Bennett and Meyer, 1952; and Chapelle 1985). Vertical hydraulic conductivity values of the Arundel have been reported at 10^{-8} to 10^{-10} cm/sec.

Both current and historic discharge from the Patuxent aquifer occurs primarily through water-well withdrawals. The Patuxent aquifer is recharged through outcrop exposures of the Patuxent Formation along the Fall Line to the northwest of the Sparrows Point area.

Elevated chloride concentrations caused by saltwater encroachment have been documented in the Patuxent aquifer since the 1930's. Elevated chloride concentrations are typically located in areas near the Patapsco River and are believed to be related to subcrops of the Patuxent formation beneath the river channel 4 to 5 miles northwest of the Sparrows Point as shown on Figure 3-2 (Chapelle, 1985).

3.3 SITE SPECIFIC GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The Sparrows Point facility is located within the Coastal Plain Physiographic Province. The unconsolidated sediments at the facility are (from youngest to oldest):

- Recent fill deposits;
- Pleistocene Talbot Formation;
- Upper Cretaceous Patapsco Formation;
- Upper Cretaceous Arundel Formation; and,
- Lower Cretaceous Patuxent Formation.

Figure 3-3 presents the general location of the Sparrows Point Site as well the configuration of the regional cross section locations for the Site Conceptual Model. Figure 3-4 illustrates the Site Conceptual Model in the north-south configuration. Figure 3-5 presents the Site Conceptual Model in the northeast-southwest (fall line) configuration.

Additional detailed cross sections were prepared for the Coke Oven and Coke Point Landfill SSAs utilizing borings advanced during the N&E activities. The Cross-Section Location Map is presented on Figure 3-6. The North-South Cross Section is presented on Figure 3-7. The East-West Cross-Section is presented on Figure 3-8.

3.3.1 Topography/Surface Drainage

The Sparrows Point facility is located on a peninsula as shown on Figure 3-3. The peninsula is bounded to the east by Old Road Bay and Jones Creek; to the south by the Patapsco River; and to the west by Bear Creek, all of which directly or indirectly drain into the Chesapeake Bay.

The current ground surface at the Sparrows Point Site is relatively flat. All major topographic features, such as buildings, landfills, and material stockpiles, are manmade. Throughout most of the peninsula, the elevation of the ground surface is between 10 and 20 feet amsl (USGS, 1969). The average elevation is about 15 feet amsl. Several manmade landforms (raw and byproduct material stockpiles) exceed 20 feet amsl in elevation, but in general are maintained in maximum pile heights of approximately 40 to 75 feet.

Surface water runoff is diverted and collected by a network of culverts, underground pipes, and drainage ditches within the process areas of the Sparrows Point plant. The storm water is then discharged to Bear Creek, Jones Creek/Old Road Bay, and the Patapsco River under existing National Pollutant Discharge Elimination System (NPDES) discharge permits. A detailed discussion of the existing NPDES discharge locations is presented in the June 2002, RSC report. Since about 1970, storm water runoff from the northern part of the Site has discharged into the Tin Mill Canal, where it is then pumped into the Humphrey Canal Waste Water Treatment Plant (HCWWTP) for treatment. The water level near the treatment plant in the Tin Mill Canal is maintained at approximately negative 1.5 foot, North American Vertical Datum of 1988 (NAVD 88) elevation.

3.3.2 Fill/Shoreline

Land reclamation and fill placement have occurred at the Site since the early 1900s. In general, fill placement occurred in three modes: (1) stream channels and estuaries that originally extended into the Sparrows Point peninsula were filled; (2) the entire southern shoreline of the peninsula was expanded southward into the Patapsco River; and (3) fill was placed throughout the Site to level grades. The extent of fill placement is shown on the Limits of Fill Map (Figure 3-9). The fill deposits are thickest (up to 40 feet) in the historic stream channels and estuaries, particularly Humphrey Creek, Greys Creek, Jones Creek, and Old Road Bay and in the two currently utilized landfill areas on the Site, including Greys Landfill and Coke Point Landfill, where the fill thickness may be as high as 70 feet.

3.3.3 Slag Fill

Recent fill deposits are manmade and are primarily related to land reclamation associated with the expansion and development of the Sparrows Point facility. The fill deposits consist primarily of iron- and steel-making slag that was placed as both “hot-poured” and “cold-poured” materials.

3.3.3.1 Slag-Fill Hydrostratigraphic Unit

The Slag-Fill unit is the uppermost hydrostratigraphic unit at the Site. The shallow water table occurs within the Slag-Fill Unit, and the groundwater in the Slag-Fill Unit is unconfined. In some areas of the Site, the Slag-Fill Unit is directly underlain by and connected to the coarser-grained beds or lenses within the Talbot Formation that comprise the Upper Talbot Channel Unit. In these areas, the Slag-Fill and Upper Talbot Channel Units form a single groundwater flow system. In much of the Site, the Slag-Fill unit is underlain by finer-grained silts and clays that comprise the Talbot Clay Aquitard. In these areas, groundwater flow in the Slag-Fill Unit is separated from groundwater flow in any underlying coarse-grained beds or lenses. The piezometers designated as shallow piezometers are screened within this slag/fill unit.

3.3.4 Talbot Formation

The Pleistocene Talbot Formation is the uppermost naturally-occurring geologic unit in most areas of the Site and underlies recent fill deposits. The Talbot Formation is about 40 to 145 feet thick with an average thickness of 88 feet. The general thickness and presence of the Talbot formation at the Site are presented on Figures 3-4 and 3-5.

3.3.4.1 Upper Talbot Channel Unit

The Upper Talbot Channel Unit is present beneath the Slag-Fill Unit in some areas of the Sparrows Point Site. Most of the piezometers designated as “intermediate wells” are generally screened within this unit. This unit consists of discontinuous beds or lenses of channel-sand deposits situated toward the top of the Pleistocene Talbot Formation. The Upper Talbot Channel Unit can be in direct physical and hydraulic contact with the overlying Slag-Fill Unit (in which case it is unconfined). The Upper Talbot Channel Unit is separated from the underlying Lower Talbot Channel Unit by the relatively impermeable fine-grained sediments, which comprise the main portion of the Talbot Formation and the Talbot Clay Aquitard. The individual lenses within the Upper Talbot Channel Unit tend to be 5 to 10 feet thick, but some lenses are as much as 30 feet thick.

3.3.4.2 Talbot Clay Aquitard

The Talbot Clay Aquitard is present beneath the Slag-Fill and Upper Talbot Channel Units throughout the Sparrows Point Site. This aquitard is comprised of relatively impermeable, fine-grained sediments, which comprise the main portion of the Talbot Formation. The Talbot Clay Aquitard separates the Slag-Fill and/or Upper Talbot Channel Units from the Lower Talbot Channel and/or Upper Patapsco Sand Units. In places, this aquitard also separates the Slag-Fill Unit from the Upper Talbot Channel Unit, and the Lower Talbot Channel from the Upper Patapsco Sand Unit. Boring logs advanced at the Sparrows Point facility indicated the Talbot aquitard is discontinuous across the Site.

Chapelle (1985) reported that the hydraulic conductivity of the fine-grained Talbot Clay Aquitard ranges from 10^{-6} to 10^{-9} cm/sec. Water levels measurements in the overlying Slag-Fill

and Upper Talbot Channel Units (approximately +1 to +10 feet amsl) indicate there is only a very slight downward gradient across the Talbot Clay Aquitard. Given this low gradient and the low permeability of the aquitard, there would be essentially no significant groundwater flow within or through the Talbot Clay Aquitard when it is present.

3.3.4.3 Lower Talbot Channel Unit

The Lower Talbot Channel Unit is present beneath the Talbot Clay Aquitard in some areas of the Sparrows Point Site. Most of the piezometers designated as “lower” piezometers are screened within this unit. The Lower Talbot Channel Unit consists of discontinuous beds or lenses of channel-sand deposits situated toward the bottom of the Pleistocene Talbot Formation. Groundwater within this unit occurs under confined conditions. The Lower Talbot Channel Unit is separated from the overlying Upper Talbot Channel Unit by the relatively impermeable fine-grained sediments, which comprise the main portion of the Talbot Formation and the Talbot Clay Aquitard. The Lower Talbot Channel Unit can be in direct physical and hydraulic contact with the underlying Upper Patapsco Sand Unit, or it can be isolated from the Upper Patapsco Sand Unit by part of the Talbot Clay Aquitard.

3.3.5 Patapsco Formation

The sediments comprising the Upper Cretaceous Patapsco Formation consist predominantly of sand and gravel interbedded with lenses of sandy clay. Colors vary from/to red, brown, and gray. The upper section of the Patapsco formation contains more fine-grained sediments than the lower section of the Patapsco Formation. The lower unit, which is generally considered to form the main aquifer, is predominantly coarse-grained and often exhibits a gravel unit at the base. In the Sparrows Point area, a middle clay bed is present between the upper and lower section of the Patapsco Formation. Existing subsurface data for Sparrows Point indicate that the middle of the clay is continuous throughout the Site.

3.3.5.1 Upper Patapsco Sand Unit

The Upper Patapsco Sand Unit is present below the Lower Talbot Channel Unit and/or the Talbot Clay Aquitard. Several of the piezometers designated as “lower” piezometers are screened within this unit. This hydrostratigraphic unit is comprised of semi-continuous sand and sandy clay lenses in the upper portion of the Patapsco Formation. Groundwater in the Upper Patapsco Sand Unit occurs under confined conditions. The Upper Patapsco Sand Unit is separated from the underlying Lower Patapsco Hydrostratigraphic Unit by the Middle Patapsco Clay Aquitard. The Upper Patapsco Sand Unit is approximately 40 to 150 feet thick.

All pumping from on-site wells within this unit was discontinued in 1945. At that time (1945), water level elevations in this unit ranged from -10 to -20 feet amsl, and groundwater flow was to the southeast. With the reduction in pumping from the Patapsco Sand Units since 1945, water levels measured during the N&E activities indicate water levels have recovered to elevations of around 0 to -0.5 foot NAVD88.

3.3.5.2 Middle Patapsco Clay Aquitard

The Middle Patapsco Clay Aquitard is a compact clay bed that is present throughout the Site. None of the N&E or RSC piezometers were installed beyond the top of this unit. This aquitard serves as the lower confining bed for the Upper Patapsco Sand Unit and as the upper confining bed for the Lower Patapsco Sand Unit. This clay bed is locally extensive in the vicinity of Baltimore (Bennett and Meyer, 1952). The Middle Patapsco Clay Aquitard ranges from 25 to 100 feet at the Sparrows Point Site.

3.3.5.3 Lower Patapsco Sand Unit

The Lower Patapsco Sand Unit is present below the Middle Patapsco Clay Aquitard. This unit consists of sand and gravel channel deposits and is present throughout the Site. None of the N&E or RSC piezometers were installed into this unit. Groundwater in the Lower Patapsco Sand Unit occurs under confined conditions. The Lower Patapsco Sand Unit is hydraulically separated from the overlying Upper Patapsco Sand Unit by the Middle Patapsco Clay Aquitard and from the underlying Patuxent Sand Unit by the Arundel Clay Aquitard. The top of this unit occurs at an elevation of approximately -210 to -285 feet amsl, and the unit ranges from 20 to 70 feet in thickness.

The Lower Patapsco Sand Unit is considered to be a regional aquifer. In the Sparrows Point area, most of the water production wells that had been completed in the Patapsco Formation were screened in this unit (rather than the Upper Unit). In the past, artificial discharge from the Lower Patapsco Sand Unit has occurred through pumping of water production wells. The water level elevations in this unit under extreme pumping conditions in 1945 were approximately -40 feet amsl. With the reduction in pumping from the Patapsco since 1945, water levels in this unit are known to have recovered to elevations of around +1 foot amsl (Chapelle 1985). Wells completed in this unit at Sparrows Point have been abandoned.

3.3.6 Arundel Formation

The sediments comprising the Arundel Formation are predominantly dense, plastic clays with nodules of iron oxide and a few discontinuous lenses of sand. According to boring logs of production wells at Sparrows Point (CH2MHill 2001b), the Arundel Formation is present throughout the Site and varies from 50 to 200 feet thick at Sparrows Point.

3.3.6.1 Arundel Clay Aquitard

The Arundel Clay Aquitard is present below the Lower Patapsco Sand Unit and is comprised of the extremely dense, tight clay of the Arundel Formation. The Arundel Clay Aquitard is present throughout the Site and is an important regional confining layer. None of the N&E or RSC piezometers were installed into this unit. This aquitard acts as the upper confining bed of the Patuxent Sand Unit and as the lower confining bed for the Lower Patapsco Sand Unit. The Arundel Clay Aquitard has very low vertical hydraulic conductivities ranging from 10^{-8} to 10^{-10} cm/sec (Chapelle, 1985).

3.3.7 Patuxent Formation

The Lower Cretaceous Patuxent Formation underlies the Arundel Formation throughout the Sparrows Point Site. This formation is about 323 feet thick at the Site, and the top of the formation is encountered at elevations of approximately -330 to -480 feet amsl. The sediments comprising the Patuxent Formation consist predominantly of sand and gravel channel deposits, most of which are good water production zones, thus the Patuxent Formation is referred to as the Patuxent Sand Unit from a groundwater occurrence perspective.

Groundwater in the Patuxent Sand Unit exists under confined conditions. The Patuxent Sand Unit is hydraulically separated from the overlying Lower Patapsco Sand Unit by the Arundel Clay Aquitard, and it is underlain by the essentially impermeable Crystalline Bedrock Aquitard. The Patuxent Sand Unit is present at an elevation of approximately -330 feet to -479 feet amsl and is up to about 325 feet thick.

The Patuxent Sand Unit is a regional water supply aquifer, however, the associated municipal wells are several miles from the Sparrows Point Site and are not downgradient of the Site. Water supply wells at Sparrows Point currently produce water from this unit. Yields up to 690 gallons per minute (gpm) have been reported (Bennett and Meyer, 1952). In 1945, water level elevations in the Patuxent Aquifer under extreme pumping conditions were approximately -60 feet amsl. In 1982, under reduced pumping conditions, water level elevations ranged from -27 to -38 feet amsl. Based on the 1982 water levels in the Patuxent, groundwater flow in the vicinity of the Site was radially inward toward the Site production wells. To the extent that continued pumping from the Patuxent at Sparrows Point has maintained water levels similar to those in 1982, groundwater flow across the Site boundary would be inward, therefore there would be essentially no opportunity for off-site impact. Because historic pumping had created an even greater water level depression in the Patuxent, this conclusion would apply historically as well.

3.3.8 Definition of Nature & Extent Hydrogeologic Zones

Three significant hydrogeologic, or groundwater, zones were identified from current and previous site investigations. These zones were designated shallow, intermediate, and lower. The shallow hydrogeologic zone includes the unconfined water table at the site. Piezometers designated as “shallow” piezometers are typically screened in the fill material. The shallow piezometer bottom-of-screen elevations generally range from +5 to -20 NAVD 88. The “intermediate” hydrogeologic zone includes the unconfined to partially confined groundwater in the Upper Talbot Channel unit. The “intermediate” piezometer bottom-of-screen elevations generally range from -20 to -50 NAVD 88. The “lower” hydrogeologic zone includes the confined groundwater in the Lower Talbot or Upper Patapsco Sand unit. The “lower” piezometer bottom-of-screen elevations generally range from -50 to -141 NAVD 88. The hydrogeologic boundary elevations vary by several feet across the Sparrows Point facility. Hydrogeologic zones at greater depth are known to exist based on a review of regional geology; however, these deeper units are isolated from these upper three units and are not described in this report.

3.3.9 Groundwater Flow

Groundwater flow is generally in a southwest direction over the entire Sparrows Point peninsula. This regional flow is influenced by local areas of recharge and discharge and diurnal events. A detailed discussion of groundwater flow within the three significant hydrogeologic zones is discussed in the following sections. During the N&E activities, groundwater measurements were collected during the December 2003 and June 2004 sampling events.

3.3.9.1 Shallow (Unconfined Slag Unit) Groundwater Zone

Groundwater contour maps of the shallow hydrogeologic zone based on the water-level data collected in December 2003 and June 2004 are presented on Figures 3-10 and 3-11. Water levels measured during the Site-Wide Groundwater Study, the RSC Study, and the N&E study show a similar configuration.

In the Greys Landfill area, groundwater mounding is observed. Groundwater flows radially from the area with the steeper gradients to the south towards the Tin Mill Canal and the west towards Bear Creek. It is likely that the water table is elevated (i.e., 12 to 16 feet amsl) under most of the landfill as a result of the higher topography.

Within the Humphrey Impoundment, Finishing Mills and Tin Mill Canal SSAs the groundwater flow in the shallow zone flows towards and apparently discharges to the Tin Mill Canal.

There is a divide (mound) in the shallow water zone observed in the south-central portion of the Sparrows Point Peninsula that extends approximately northeast to southwest. North and west of the divide, shallow groundwater appears to flow northwestward and discharge into Tin Mill Canal and Bear Creek. Groundwater south and east of the divide flows toward Jones Creek and the Patapsco River. The water table slope decreases sharply as it encounters the original shoreline of Sparrows Point.

Within the Coke Oven and Coke Point SSAs the shallow groundwater generally flows to the southwest. However, as the former shoreline is encountered the groundwater gradient sharply decreases and the flow becomes more radial toward the surrounding surface water bodies.

Local Dewatering Influence

The Sparrows Point peninsula includes a ship maintenance facility in an area formerly known as the BSC Shipyard that has been operating under separate ownership from ISG property since 1997. The ship maintenance facility operates a graving dock approximately 100 feet wide by 300 feet long that is located immediately northwest of the Coke Oven SSA. Operation of the graving dock utilizes an underdrain dewatering system beneath the floor slab of the dock (located at approximately -40 feet amsl) that is pumped continuously when in operation to minimize hydrostatic uplift from groundwater on the floor slab. When in operation, dewatering pumps withdraw approximately 1.2 to 2 million gallons of groundwater per day from the area beneath and surrounding the graving dock unit.

The influence of the graving dock on the shallow groundwater zone was evaluated by comparing groundwater contour maps that were generated from data collected when the dewatering system was in operation (December 2002) and when it was non-operational (June 2004). From this comparison, it is evident that the dewatering system is influencing groundwater flow in the shallow zone, although to a relatively minor extent. The effects of dewatering at the dock can be examined by reviewing water levels recorded at piezometer TS05-PPM007, which is located less than 500 feet southeast of the graving dock. A water level of 0.19 feet amsl during dewatering and 1.52 feet amsl during non-dewatering conditions was observed. Although a high volume of water is being withdrawn from the graving dock during its operation, recharge from the Patapsco River to the west limits the extent of the cone of depression inland from the graving dock. In addition, since the shallow zone is unconfined, groundwater is derived from gravity drainage, which will limit the rate of expansion of a cone of depression.

Hydraulic Conductivity

Four piezometers were tested to determine hydraulic conductivity in the shallow groundwater zone. These tests included a single test on piezometer SW05-PZM004 (CH2M Hill, 2002a) and a rising and falling head slug tests on piezometers CO27-PZM012, CO32-PZM041, and SW71-PZM007 (by URS in 2004). The results were highly variable and ranged over three orders of magnitude (4.1×10^{-5} to 1.7×10^{-2} cm/sec). This range is consistent with what would be anticipated from the uncontrolled placement of fill material. A geometric mean of 5.9×10^{-4} was calculated from the slug test results; however, this value should be used with caution in any calculations since the hydraulic conductivity is highly variable in this material. Results for recent and historical hydraulic conductivity testing at the Sparrows Point facility are presented in Table 3-1.

Tidal Influence

To evaluate the tidal influence, 13 piezometers were selected, and three stilling wells (surface water gauges) were established to monitor water levels in the area south of the graving dock, west of the Coke Oven Area, and along Old Road Bay by URS in December 2003. The influence of the tides on the shallow groundwater zone was either delayed or not present, depending on the piezometer being observed. Shallow piezometers SW13-PZM003 and CO10-PZM006 showed no response to tides, while CO27-012 showed a delayed response. Because the water levels at these locations occur at elevations slightly above mean sea level, a significant tidal influence is not expected.

3.3.9.2 Intermediate Groundwater Zone

Groundwater contour maps of the intermediate hydrogeologic zone based on the water-level data collected in December 2003 and June 2004 are presented on Figures 3-12 and 3-13. Intermediate groundwater flow is generally consistent with flow patterns observed in the overlying slag unit, indicating that the shallow and intermediate groundwater zones are hydraulically connected. The presence of clay and silt layers within the intermediate groundwater likely retard the groundwater and vertical recharge from the upper fill material. A downward gradient is most pronounced in areas of groundwater mounding including the Greys

Landfill SSA and the south central portion of the Sparrows Point Peninsula. The vertical gradient dissipates near the shoreline and along Tin Mill Canal.

In the Greys Landfill area, groundwater mounding is observed in the intermediate groundwater zone similar to the shallow zone. Groundwater flows radially in all directions from the Greys Landfill area.

Within the Humphrey Impoundment, Finishing Mills and Tin Mill Canal SSAs the groundwater flow in the intermediate zone continues to flow towards the Tin Mill Canal. Flow adjacent to Tin Mill Canal is influenced by water withdrawal from the Canal. The water withdrawal results in depressed water levels along the canal.

There is a mound in the intermediate water zone observed in the south-central portion of the Sparrows Point Peninsula. Groundwater flows radially from this mounded area to the surrounding water bodies.

Within the Coke Oven and Coke Point SSAs the shallow groundwater generally flows to the southwest. However, the groundwater in this area is very flat.

Graving Dock Influence

The influence from the dewatering system at the graving dock on water levels is more pronounced in the intermediate groundwater zone than in the shallow zone. This condition can be attributed to: location of the pumps at depths that correspond with the stratigraphy of this unit and decreased recharge from the Patapsco River, and the partially-confined condition of this zone. The spread of a cone of depression from a pumping center under partially-confined conditions is generally quicker than that under unconfined conditions. The influence of the graving dock pumping is therefore observable over 2,000 feet away in 2001, where flow in the Coke Oven Area is shifted to the northwest in the intermediate zone, while flow in the shallow zone is to the southwest.

Hydraulic Conductivity

The hydraulic conductivity of the intermediate groundwater zone was evaluated at five piezometers. These piezometers include SW17-PZM025, SW05-039, SW20-PZM041 and SW13-PZM025, where a single slug test was conducted (CH2M Hill, 2001b), and CO27-PZM046 and SW17-PZM038 where a rising and falling slug test were conducted at each piezometer. The results ranged over three orders of magnitude (5×10^{-6} to 7.6×10^{-3} cm/sec). A geometric mean of 4.7×10^{-4} was calculated from the slug test results. Results for recent and historical hydraulic conductivity testing at the Sparrows Point facility are presented in Table 3-1.

Tidal Influence

The influence of the tides on the intermediate zone was relatively instantaneous with high and low tides producing corresponding high and low groundwater levels with approximately ¼ the amplitude of the tidal fluctuations. This pattern indicates the intermediate groundwater zone is

partially confined and is hydraulically connected to or outcrops within surface water of the Chesapeake Bay area.

3.3.9.3 Lower Groundwater Zone

Groundwater contour maps of the lower hydrogeologic zone based on the water-level data collected in December 2003 and June 2004 are presented on Figures 3-14 and 3-15. The groundwater flow in the lower zone is primarily to the southwest with little hydraulic influence from the shallow or intermediate zones. The water level data also show no influence from local dewatering activities associated with the graving dock. The vertical gradient is downward over much of Sparrows Point; however, the vertical gradient is near zero or slightly upward in the southeast portion of the peninsula and along Tin Mill Canal under current flow conditions.

Hydraulic Conductivity

The hydraulic conductivity of the lower groundwater zone was evaluated by conducting rising and falling head slug tests at nine piezometers by URS in December 2003. The results were variable and ranged over two orders of magnitude (3.6×10^{-5} to 6.1×10^{-3} cm/sec). A geometric mean of 1.0×10^{-3} cm/sec was calculated from the slug test results. The hydraulic conductivity values calculated for this zone are typical of silty sand to fine sand. Of the three groundwater zones evaluated through slug testing, the lower zone was the most uniform. Results for recent and historical hydraulic conductivity testing at the Sparrows Point facility are presented in Table 3-1.

Tidal Influence

The influence of the tides on the lower groundwater zone was similar to that observed in the intermediate zone. This pattern indicates the lower groundwater zone is partially confined and is hydraulically connected to or outcrops within surface water of the Chesapeake Bay area.

**SECTION THREE
TABLES**

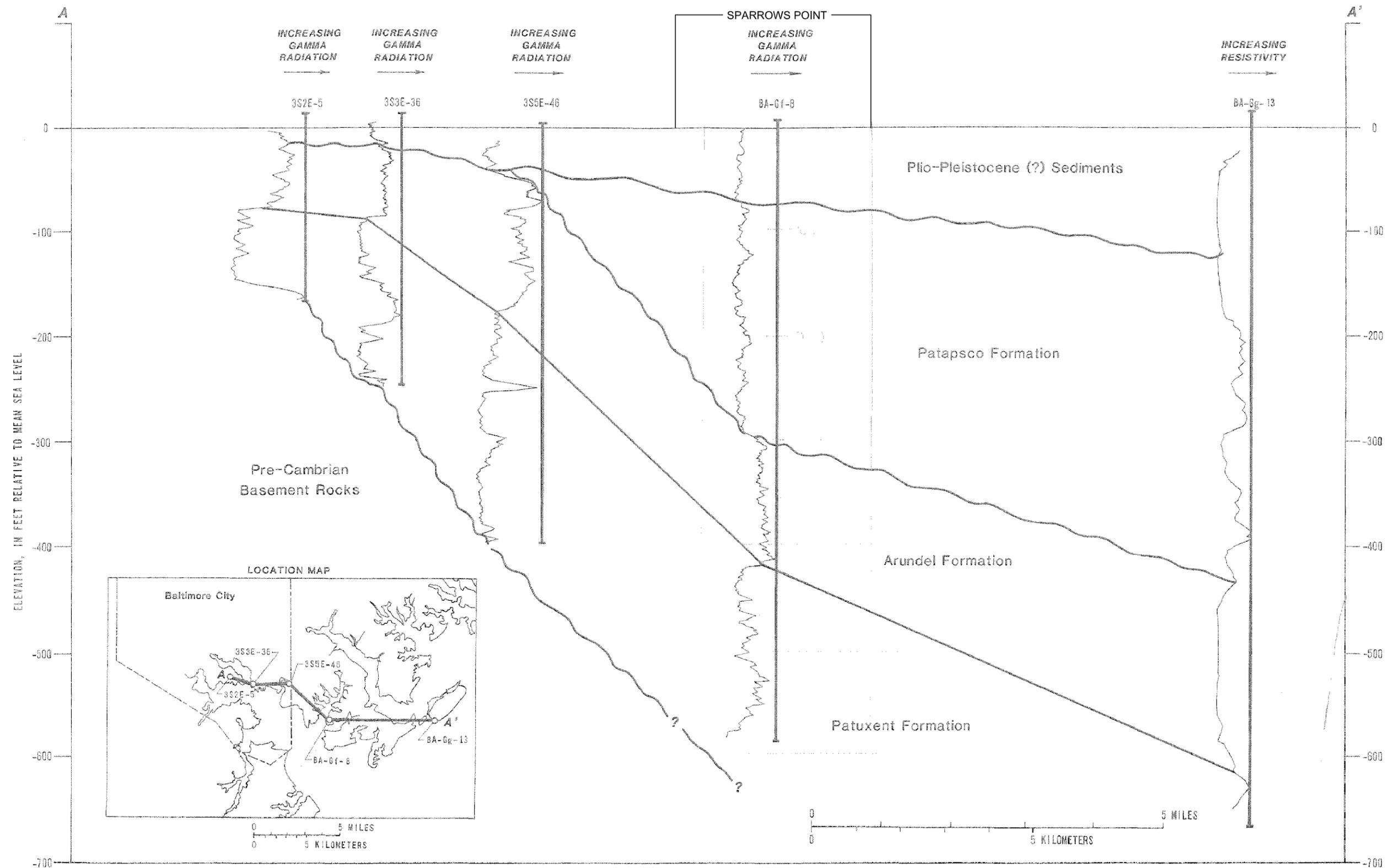
Table 3-1
Hydraulic Conductivity Results from 2002 through 2003
ISG Sparrows Point, Inc.

| Well ID | K (cm/s) | Unit | Data source |
|-----------------------|-----------------|--------------|-------------|
| CO27-PZM012 | 0.016370 | Shallow | 1 |
| CO27-PZM012 | 0.017490 | Shallow | 1 |
| SW05-PZM004 | 0.000041 | Shallow | 2 |
| SW17-PZM007 | 0.000360 | Shallow | 1 |
| SW17-PZM007 | 0.000787 | Shallow | 1 |
| <i>geometric mean</i> | <i>0.001272</i> | | |
| CO27-PZM046 | 0.002628 | Intermediate | 1 |
| CO27-PZM046 | 0.007204 | Intermediate | 1 |
| CO32-PZM041 | 0.000111 | Intermediate | 1 |
| CO32-PZM041 | 0.000067 | Intermediate | 1 |
| CO32-PZM041 | 0.000735 | Intermediate | 1 |
| CO32-PZM041 | 0.000589 | Intermediate | 1 |
| CO32-PZM041 | 0.001329 | Intermediate | 1 |
| CO32-PZM041 | 0.003315 | Intermediate | 1 |
| SW05-PZM039 | 0.000037 | Intermediate | 2 |
| SW13-PZM025 | 0.000005 | Intermediate | 2 |
| SW17-PZM038 | 0.007614 | Intermediate | 1 |
| SW17-PZM038 | 0.009235 | Intermediate | 1 |
| SW20-PZM041 | 0.000021 | Intermediate | 2 |
| GL18-PZM039 | 0.001285 | Intermediate | 1 |
| GL18-PZM039 | 0.001132 | Intermediate | 1 |
| <i>geometric mean</i> | <i>0.000545</i> | | |
| CO27-PZM122 | 0.003182 | Deep | 1 |
| CO27-PZM122 | 0.006076 | Deep | 1 |
| CP05-PZM128 | 0.000036 | Deep | 1 |
| CP05-PZM128 | 0.000073 | Deep | 1 |
| HI08-PZM060 | 0.002009 | Deep | 1 |
| HI08-PZM060 | 0.005318 | Deep | 1 |
| SW07-PZM108 | 0.004627 | Deep | 1 |
| SW07-PZM108 | 0.004019 | Deep | 1 |
| SW13-PZM111 | 0.000170 | Deep | 1 |
| SW13-PZM111 | 0.000114 | Deep | 1 |
| SW17-PZM113 | 0.002002 | Deep | 1 |
| SW17-PZM113 | 0.002024 | Deep | 1 |
| <i>geometric mean</i> | <i>0.000980</i> | | |

Data Source:

- 1 URS 2003 (N&E)
- 2 CH2M Hill 2002 (RSC)

**SECTION THREE
FIGURES**



ISG SPARROWS POINT, INC.

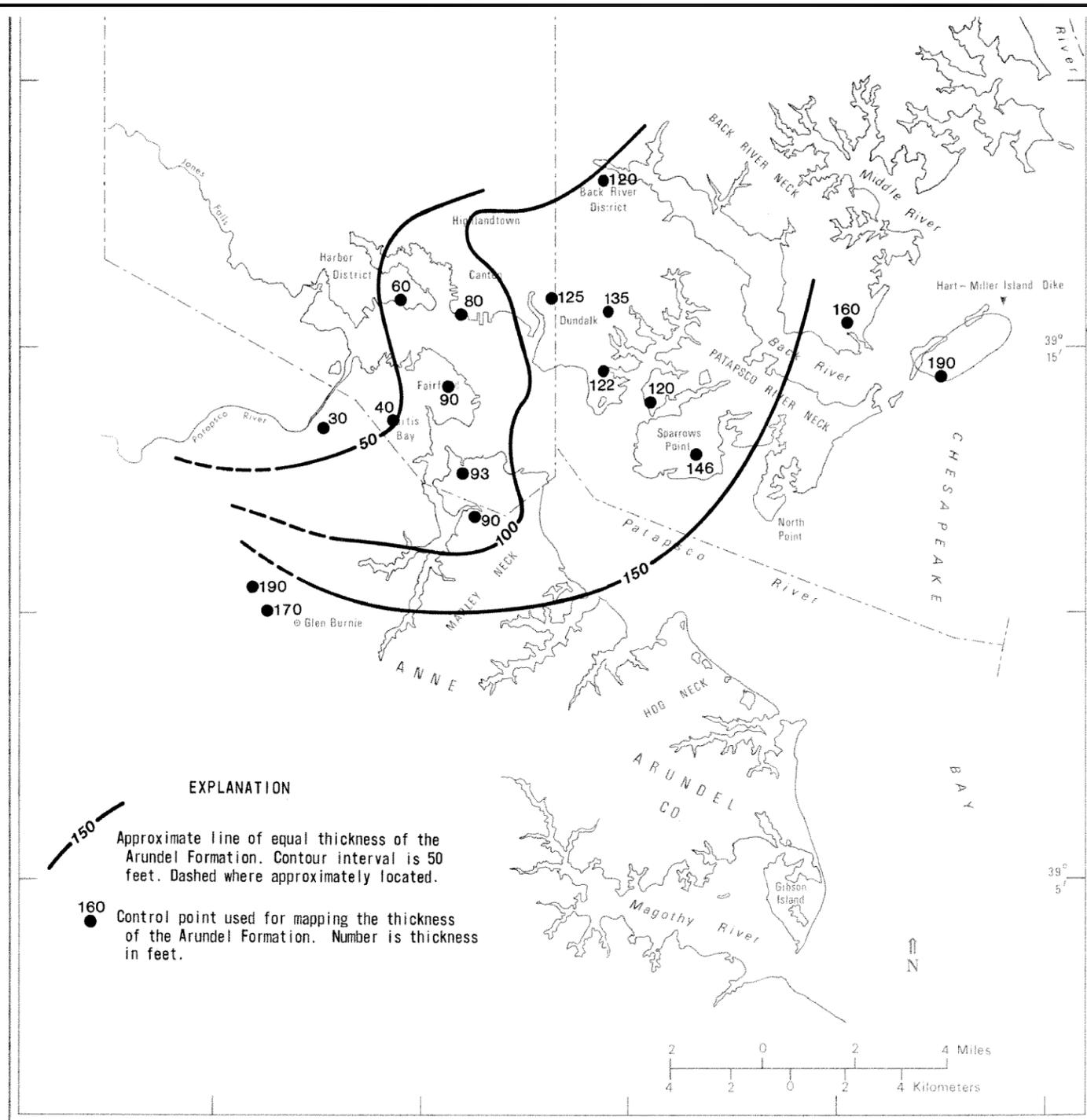
Figure 3-1
Regional Cross Section

0 0
SCALE AS SHOWN



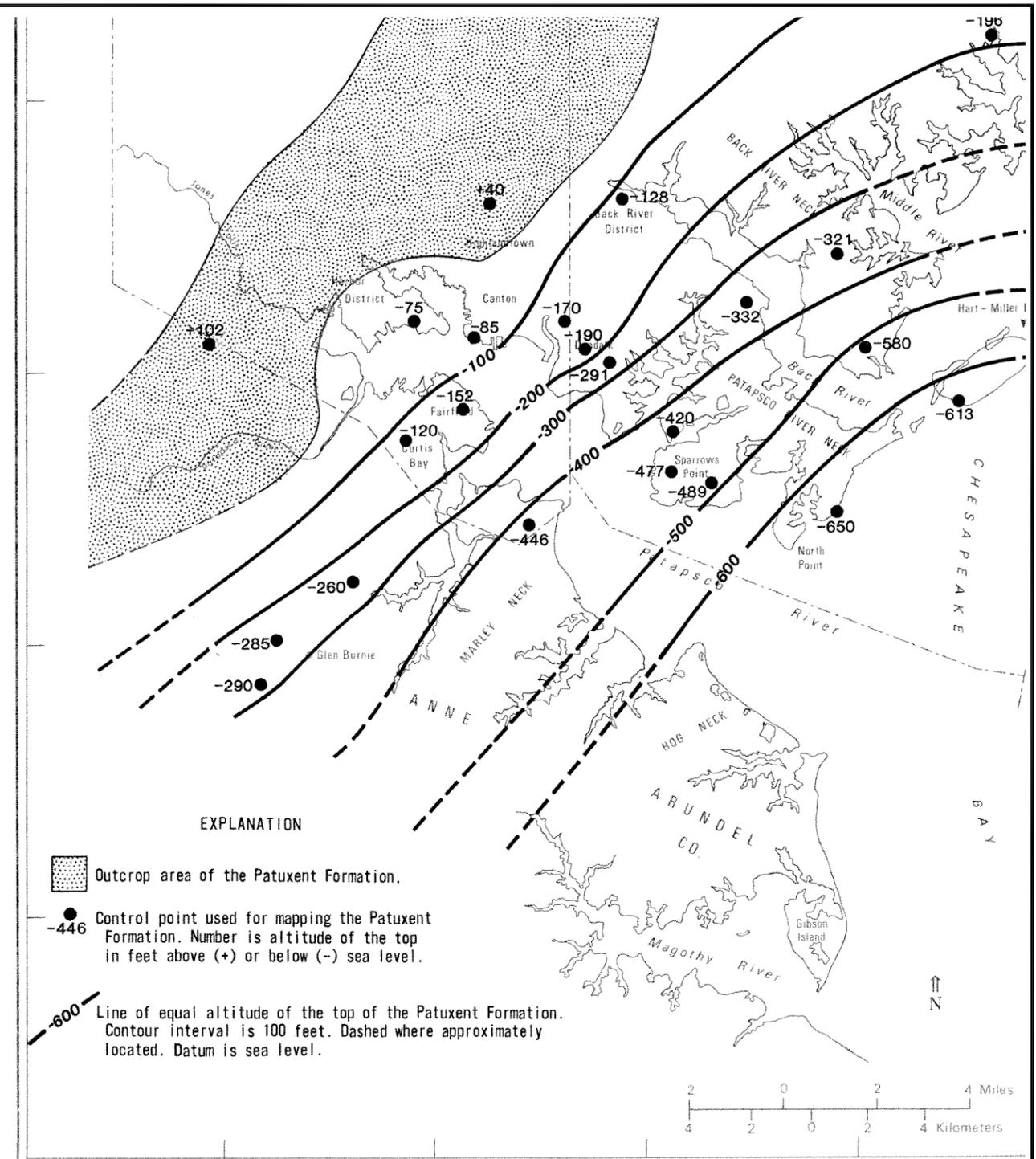
Note:
Original drawing obtained from MGS Report of Investigation No. 43. (Chapelle 1985)

URS



Base map from the Maryland Geological Survey County Topographic Map Series, 1:62,500

Figure 3.- Isopach of the Arundel Formation.



Base map from the Maryland Geological Survey County Topographic Map Series, 1:62,500

Figure 2.- Generalized outcrop area and altitude of the top of the Patuxent Formation.

| |
|---------------------------------------|
| ISG SPARROWS POINT, INC. |
| Figure 3-2 |
| Regional Arundel and Patuxent Figures |
| URS |



CURTIS BAY AND CREEK CHANNEL DEPTHS
TABULATED FROM SURVEYS BY THE CORPS OF ENGINEERS - SURVEYS TO NOV 2000

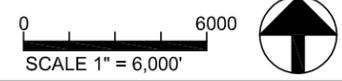
| NAME OF CHANNEL | CONTROLLING DEPTHS FROM SEAWARD IN FEET AT MEAN LOWER LOW WATER (MLLW) | | | DATE OF SURVEY | PROJECT DIMENSIONS | | |
|--------------------|--|----------------|---------------|----------------|--------------------|----------------|--------------|
| | LEFT QUARTER | MIDDLE QUARTER | RIGHT QUARTER | | WIDTH (FEET) | LENGTH (MILES) | DEPTH (FEET) |
| CURTIS BAY CHANNEL | 49.7 | 49.8 | 49.5 | 3.5.11-00 | 400-1275 | 1.36 | 50 |
| CURTIS CREEK | | | | | | | |
| LOWER REACH | 34.4 | 35.8 | 35.3 | 11-00 | 200 | 0.54 | 35 |
| MIDDLE REACH | 19.3 | 20.7 | 17.6 | 8-98/3.11-00 | 200-380 | 1.09 | 22 |
| UPPER REACH | 13.4 | 17.9 | 13.5 | 8-98/8-90 | 200-150 | 0.28 | 22 |

NOTE - CONSULT THE CORPS OF ENGINEERS FOR CHANGES SUBSEQUENT TO THE ABOVE INFORMATION

BALTIMORE HARBOR CHANNEL DEPTHS
TABULATED FROM SURVEYS BY THE CORPS OF ENGINEERS - SURVEYS TO FEB 2002

| NAME OF CHANNEL | CONTROLLING DEPTHS FROM SEAWARD IN FEET AT MEAN LOWER LOW WATER (MLLW) | | | DATE OF SURVEY | PROJECT DIMENSIONS | | | |
|------------------------------|--|----------------|---------------|----------------|--------------------|----------------|--------------|----|
| | LEFT QUARTER | MIDDLE QUARTER | RIGHT QUARTER | | WIDTH (FEET) | LENGTH (MILES) | DEPTH (FEET) | |
| CRAGHILL ENTRANCE | 47.5 | 50.7 | 50.4 | 8-02 | 700 | 3.09 | 50 | |
| CRAGHILL CHANNEL | 48.1 | 50.3 | 50.5 | 49.7 | 7-00 | 700 | 2.80 | 50 |
| CRAGHILL ANGLE | 50.2 | 49.8 | 50.5 | 30.4 | 11-01-1-02 | 700-1870 | 1.55 | 50 |
| CRAGHILL CHANNEL UPPER RANGE | 49.2 | 50.2 | 50.2 | 49.1 | 7-00-1-01 | 700 | 2.11 | 50 |
| CUTOFF ANGLE | 50.2 | 49.8 | 50.5 | 48.5 | 1-01 | 700-1740 | 0.98 | 50 |

CAUTION
SUBMARINE PIPELINES AND CABLES



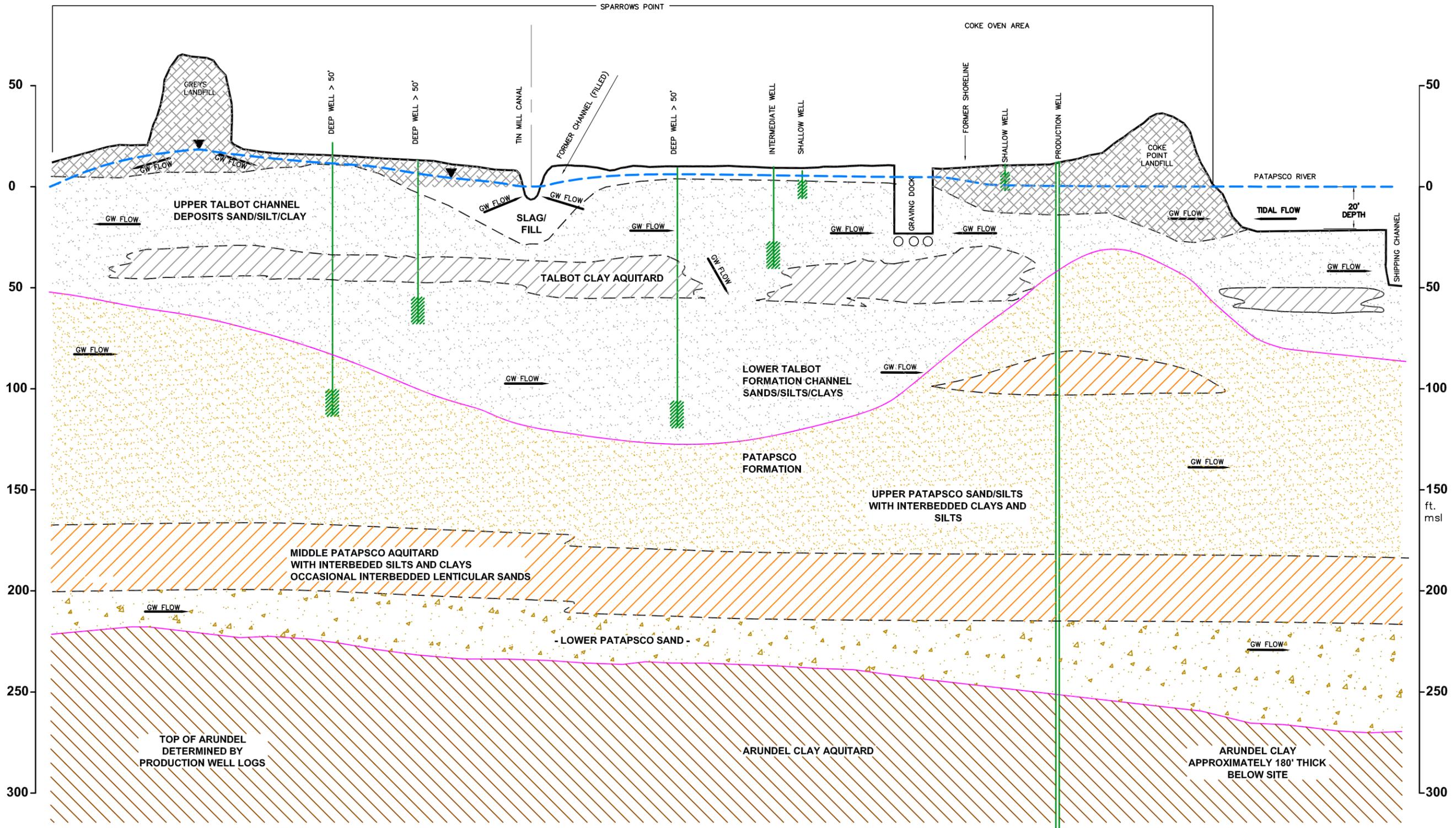
ISG SPARROWS POINT, INC.

Figure 3-3
Regional Cross Section
Location Map



N

S



LEGEND

- | | | | | | |
|--|---|--|---|--|--|
| | FILL | | CLAY PATAPSCO PREDOMINATELY CLAY SOME INTERBEDDED SANDS & SILTS | | PATUXENT INTERBEDDED SAND/ GRAVEL & SILT |
| | TALBOT LENTICAL SAND/ SILTY CLAY | | LOWER PATAPSCO LENTICAL SANDS/ SILTS & CLAY | | |
| | UPPER PATAPSCO LENTICAL SANDS/ SILTS/ SOME CLAY | | ARUNDEL CLAY | | |



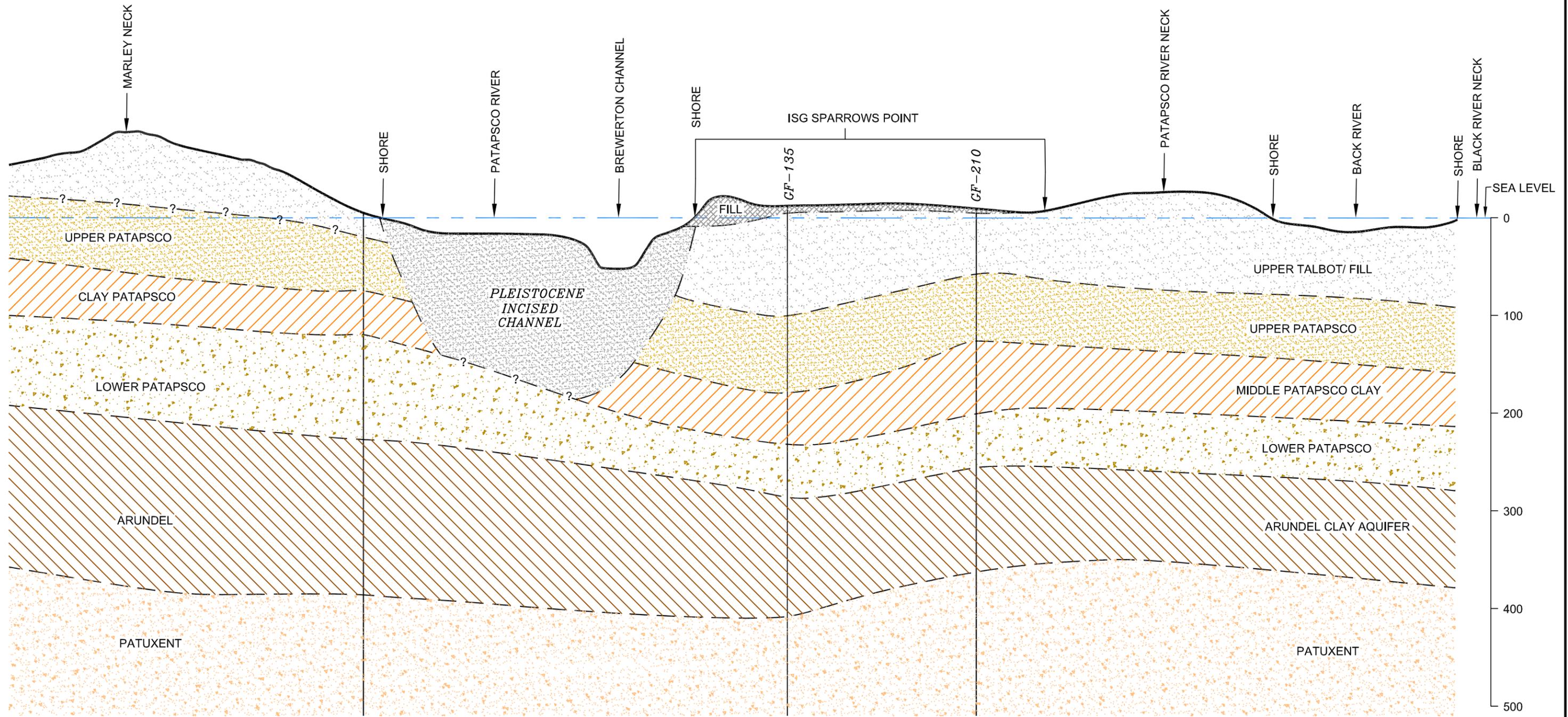
ISG SPARROWS POINT, INC.

Figure 3-4
Site Conceptual Model
in the North - South Configuration



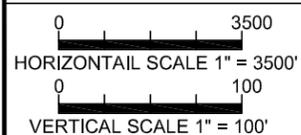
SOUTHWEST

NORTHEAST



LEGEND

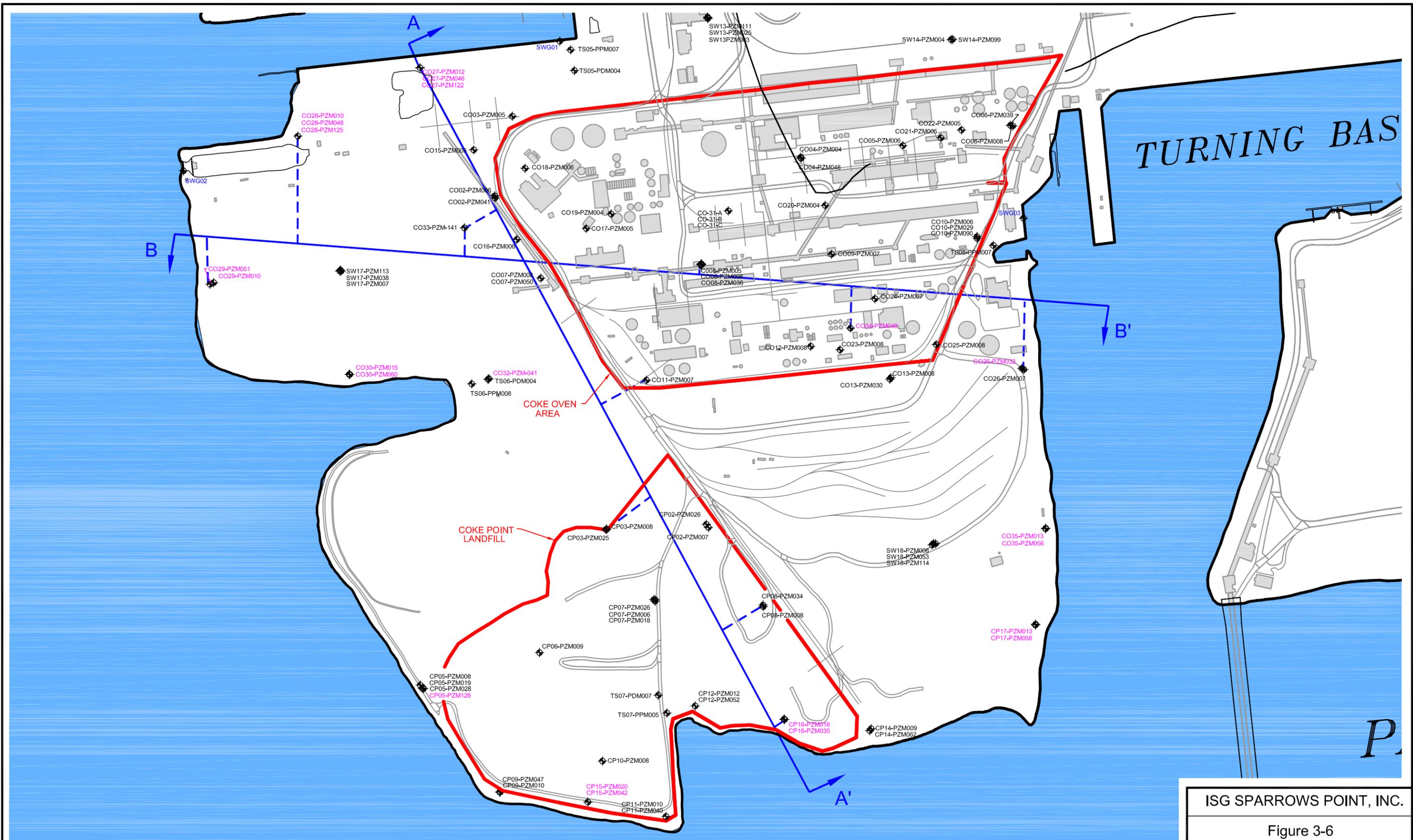
- SEA LEVEL
- FILL
- TALBOT LENTICAL SAND/ SILTY CLAY
- UPPER PATAPSCO LENTICAL SANDS/ SILTS/ SOME CLAY
- CLAY PATAPSCO PREDOMINATELY CLAY SOME INTERBEDDED SANDS & SILTS
- LOWER PATAPSCO LENTICAL SANDS/ SILTS & CLAY
- ARUNDEL CLAY
- PATUXENT INTERBEDDED SAND/ GRAVEL & SILT



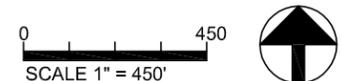
ISG SPARROWS POINT

Figure 3-5
 Site Conceptual Model
 in the Northeast - Southwest
 Configuration

URS

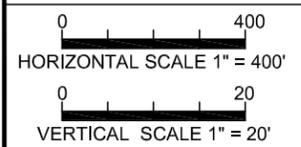
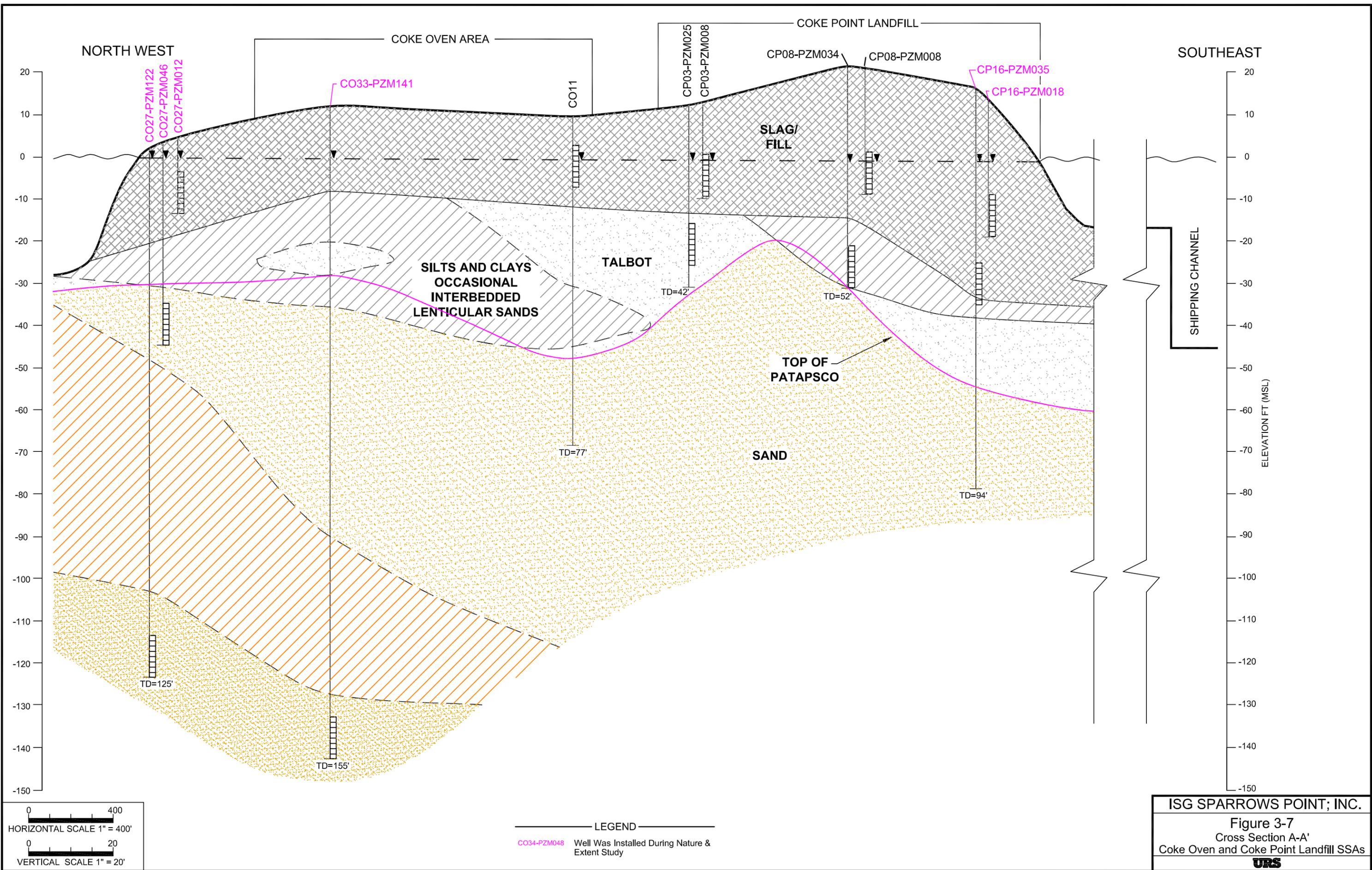


ISG SPARROWS POINT, INC.
 Figure 3-6
 Cross Section Location Map
 URS



LEGEND

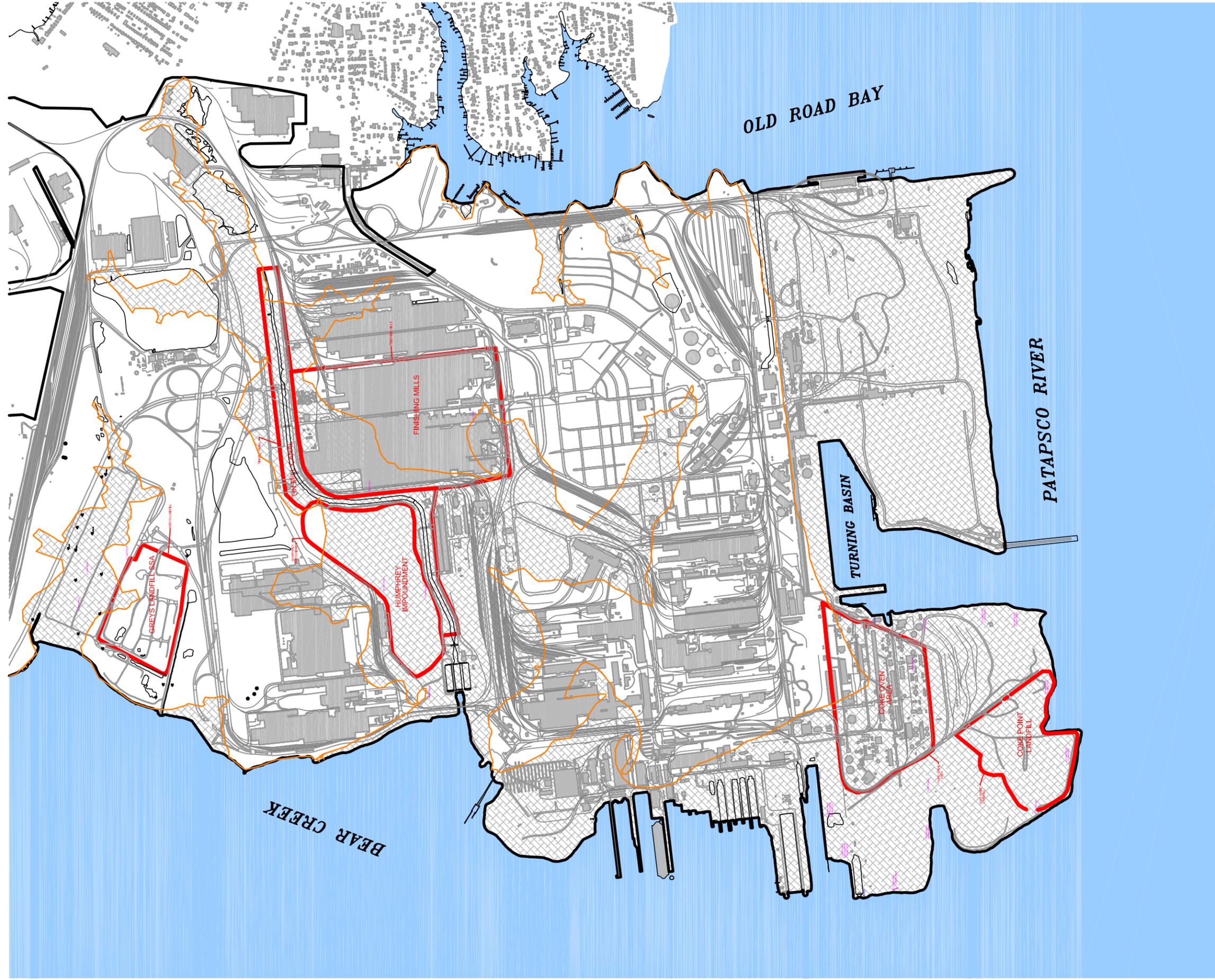
| | | | |
|-------------|---|-------|---|
| CO25-PZM008 | Well Was Installed Prior To Nature & Extent Study | SWG03 | Surface Water Gauge Was Installed During URS Extension Of Nature & Extent Study |
| CO34-PZM048 | Well Was Installed During Nature & Extent Study | | |



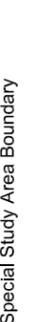
ISG SPARROWS POINT; INC.

Figure 3-7
Cross Section A-A'
Coke Oven and Coke Point Landfill SSAs

URS



LEGEND

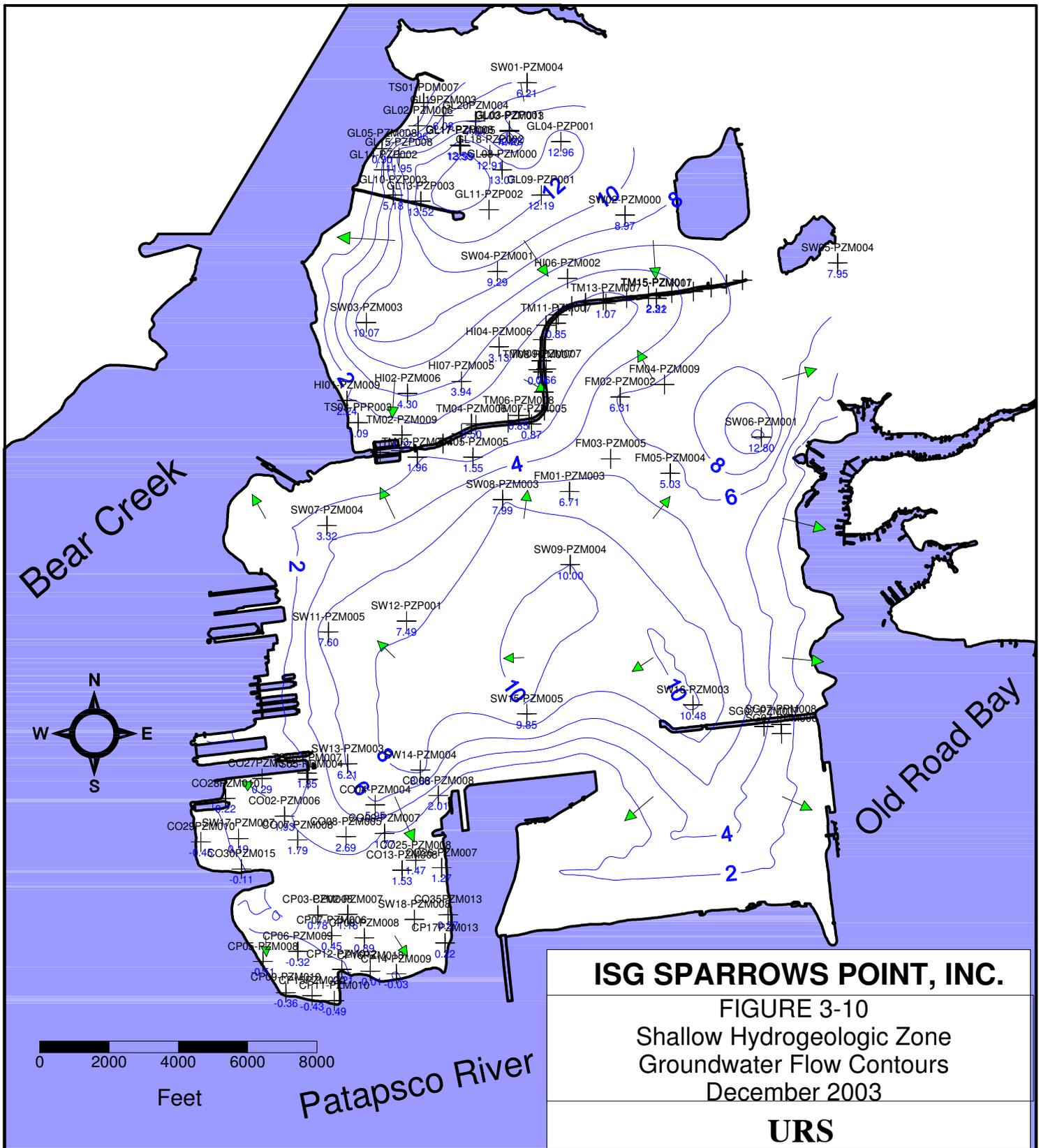
-  Indicates Limits Of Slag Fill Materials Placed On-Site Since 1916
-  1915 Approximate Shoreline Boundary
-  SSA
-  Special Study Area
-  Special Study Area Boundary

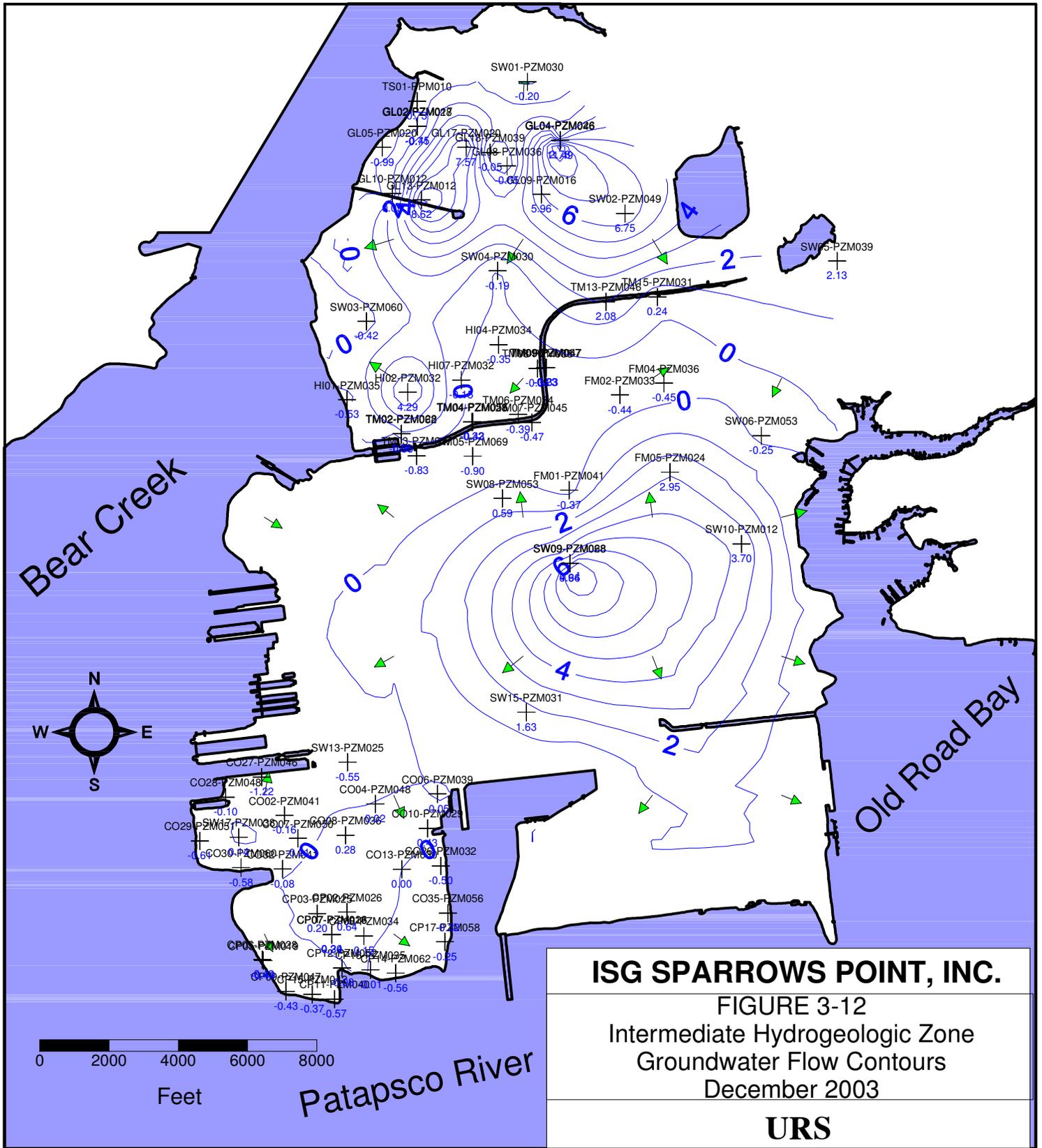


ISG SPARROWS POINT, INC.

Figure 3-9
Limits of Fill on
Sparrows Point Site

URS

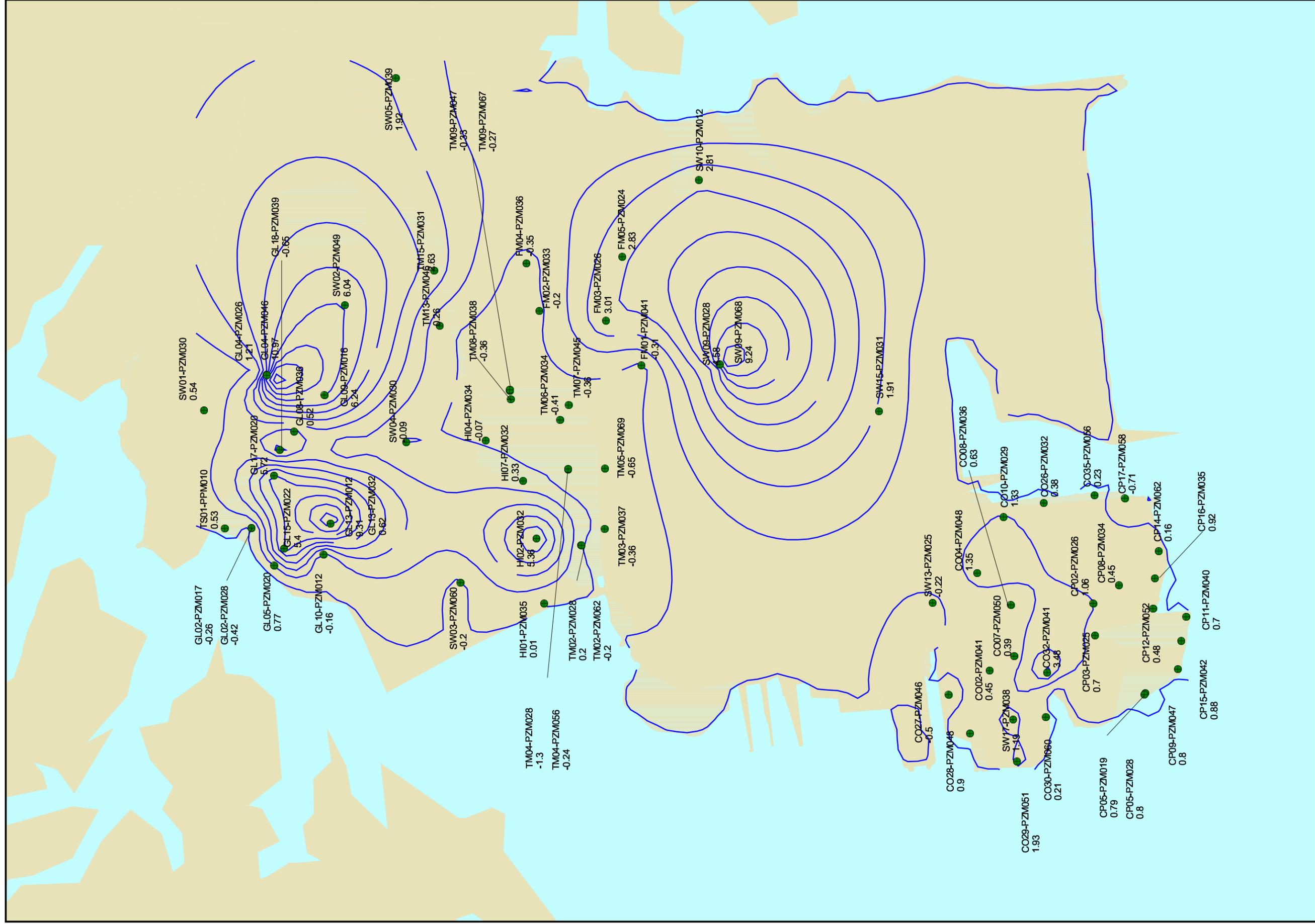


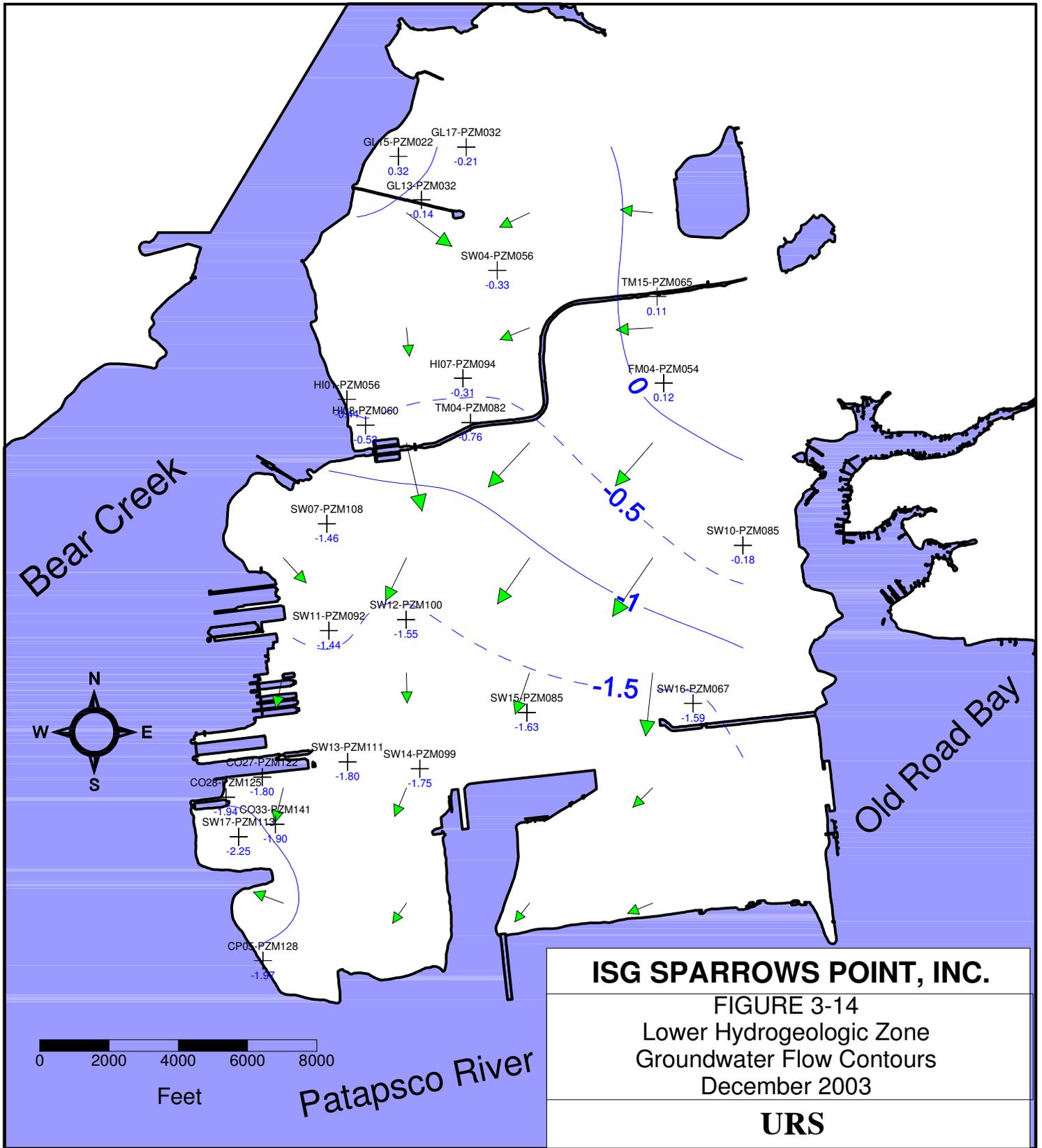


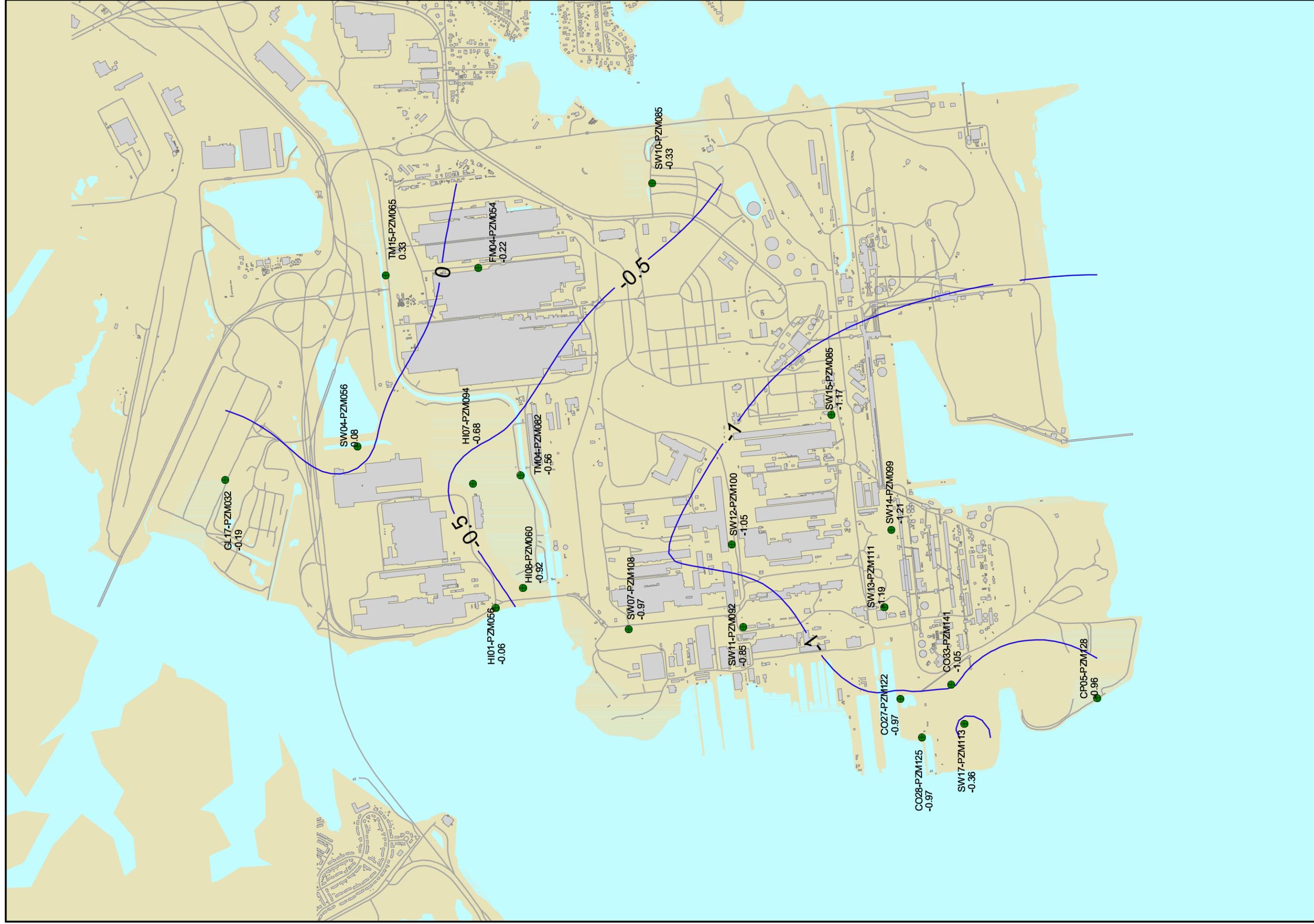
ISG SPARROWS POINT, INC.

FIGURE 3-12
Intermediate Hydrogeologic Zone
Groundwater Flow Contours
December 2003

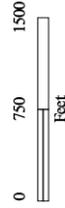
URS







● Sample Location
 — Deep Water Level Contour



ISG Sparrows Point, Inc.
Lower Hydrogeologic Zone
Groundwater Flow Contours
 June 2004

Figure
3-15



This section discusses the results of chemical analyses related to the N&E investigation. This section is divided into subsections that address the evaluation of data quality and present analytical results for each of the SSAs.

4.1 EVALUATION OF DATA QUALITY

All samples collected in support of the N&E Investigation were analyzed by the Gascoyne Division of Microbac Laboratories, Inc. (Gascoyne) with the exception of methane analyses, which were subcontracted to GPL Laboratories. The data reports were subjected to a tiered independent data assessment, conducted by URS chemists. For the June 2004 sampling event, full data validation was performed on the initial data packages to identify any serious data quality issues and recommend any necessary corrective actions early in this phase of the project. A more streamlined assessment was performed for the subsequent data packages.

The full validation process includes an assessment of Quality Control (QC) parameters and an evaluation of compliance with the cited methods, as well as a detailed review of the analytical data and supporting documentation to verify that data are easily traceable and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator. Gascoyne data packages 0406449 and 0406524 underwent full validation as described. The remaining June 2004 data, as well as the Fall 2002 N&E data, underwent a less extensive data review that included evaluating the QC parameters and method compliance, but did not include reconstruction of the analytical data (QC parameters reviewed included check sample recoveries, surrogate recoveries, laboratory blank results, matrix spike/matrix spike duplicate recoveries, detection limits, and holding times). The data validation and review findings are described in detail in the Data Assessment Report in Appendix C.

In general, if the reported results met method criteria and were supported by acceptable QC results, no qualification of the data was necessary. If the data quality review supported the presence or absence of an analyte, but identified deficiencies that affected the reported concentration or quantitation limit, the result was qualified as estimated (i.e., a qualifier was added to the reported laboratory result). When a bias could be identified, the results were flagged accordingly (“K” for high bias, “L” for low), otherwise a generic “J” flag was applied. J-qualified data also includes concentrations that are considered estimated because they are below the reporting limit but greater than ½ the reporting limit. Most of the data qualified by the data reviewer were due to matrix spike or surrogate recoveries outside of QC criteria.

If laboratory documentation and the subsequent QC review cannot adequately support the presence or absence of an analyte in a given sample, the data must be rejected. No QC deficiencies of that severity were identified during the review process; consequently, there were no rejections of laboratory data in either the Fall 2002 or June 2004 data.

Sample results were also qualified to indicate possible field or laboratory contamination. Selected sample results were negated (changed to non-detects) due to the presence of specific analytes in laboratory and/or field blanks. Affected analytes included several metals and the common contaminants acetone, 2-butanone, methylene chloride, and bis (2-ethylhexyl) phthalate, among others. Sample results were considered positive (i.e., a chemical is present)

only if the concentration detected in the sample was at least five times (10 times for common contaminants) greater than the highest concentration detected in an associated blank.

The objective of independent data assessment is to determine and document the quality and usability of the data. The findings of the N&E data assessment indicate that 100% of the reported data are usable (with qualification as appropriate).

4.2 GREYS LANDFILL

Analytical results for detected analytes of samples collected during the N&E field activities at the Greys Landfill SSA are presented in Tables 4-1 (VOCs), 4-2 (semi-volatile organic compounds (SVOCs)) and 4-3 (metals and miscellaneous analytes). Additionally, Tables D-1 through D-4 located in Appendix D present complete analytical results for groundwater samples collected during the RSC study and all subsequent N&E groundwater sampling events for comparison.

4.2.1 Shallow Groundwater Zone

4.2.1.1 Volatile Organic Compounds

Seven VOCs were detected in the shallow groundwater zone of Greys Landfill during the N&E sampling events. These VOCs include 1,1-dichloroethane (1,1-DCA) (170 micrograms per liter ($\mu\text{g/L}$)), benzene (1500 $\mu\text{g/L}$), bromoform (2.8 $\mu\text{g/L}$), ethylbenzene (9 $\mu\text{g/L}$), tetrachloroethene (13 $\mu\text{g/L}$), toluene (290 $\mu\text{g/L}$) and total xylene (140 $\mu\text{g/L}$). All of these VOCs except bromoform and tetrachloroethene were also detected during the RSC. Acetone and carbon disulfide were detected during the RSC but not during the N&E sampling rounds.

The VOC detected most frequently in the shallow groundwater zone of Greys Landfill is benzene and is shown on Figure 4-1. The maximum concentration of benzene detected is 1,500 $\mu\text{g/L}$ in GL18-PZP002, located at the northeast boundary of the SSA.

The benzene concentrations in samples collected during the RSC and the N&E studies indicate that all benzene concentrations from samples collected from piezometers located along the eastern, southern and western border of the Greys Landfill SSA were all below 5 $\mu\text{g/L}$. It appears that the VOC impact to groundwater in the shallow zone is generally confined to the northeastern portion of Greys Landfill SSA. Benzene was detected in piezometers north of the SSA boundary. However, most recent data indicates a two order of magnitude decrease in benzene concentrations at the shallow piezometers north of the Greys Landfill SSA, including: GL19-PZM003 (5.2 $\mu\text{g/L}$), GL20-PZM004 (19 $\mu\text{g/L}$) and GL03-PZM013 (43 $\mu\text{g/L}$).

4.2.1.2 Semi-Volatile Organic Compounds

Several SVOCs were detected in the shallow groundwater zone of Greys Landfill during the N&E study. Naphthalene was detected most frequently. Analytical results for naphthalene are shown on Figure 4-1. Maximum SVOC concentrations detected in the shallow zone (GL18-PZP002) include:

naphthalene at 2000 µg/L; 4-methylphenol 3-methylphenol at 1000 µg/L; 2,4 dimethylphenol at 740 µg/L; phenol at 490 µg/L; 2-methylphenol at 360µg/L; and acenaphthylene at 120 µg/L. Piezometer GL18-PZP002 is located at the northeast corner of the Greys Landfill SSA. Shallow zone groundwater samples collected at down gradient locations GL03 and GL20 indicate a two order of magnitude decrease in all SVOC concentrations.

Several other SVOCs detected at concentrations near or approaching the laboratory reporting limits include: acenaphthene at 24 µg/L; dibenzofuran at 54 µg/L; fluorene at 55 µg/L; fluoranthene at 11 µg/L; phenanthrene at 73 µg/L; pyrene at 13 µg/L; and pyridine at 42 µg/L.

Based on a review of the groundwater results from the RSC and the N&E groundwater studies, it appears that the SVOC impact to groundwater in the shallow zone is generally confined to the northern portion of Greys Landfill SSA. SVOCs were detected in piezometers north of the SSA boundary. However, most recent data (2004) indicates a two order of magnitude decrease in naphthalene concentrations at the shallow piezometers north of the Greys Landfill SSA, including: GL19-PZM003 (<10 µg/L), GL20-PZM004 (16 µg/L) and GL03-PZM013 (67 µg/L).

4.2.1.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals are present in the shallow groundwater zone associated with Greys Landfill. Analytical results for arsenic and thallium are shown on Figure 4-2. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum arsenic concentrations were detected in the shallow zone at GL02-PZM017 at 16 µg/L. The maximum thallium concentration detected in the shallow zone is 7.8 µg/L (total) in GL18-PZP002. Both GL02 and G118 are located along the northern border of the Greys Landfill SSA.

Other COPI analytes detected during the N&E study in the Greys Landfill SSA include cyanide and sulfide. The maximum concentration of available cyanide was detected in GL18-PZP002 (23 µg/L), which is located near the northeast corner of the Greys Landfill SSA. The maximum sulfide concentration detected in the shallow zone is 21,000 µg/L in GL18-PZP002, located near the northeast of the Greys Landfill SSA boundary.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a limited presence of metals including arsenic and thallium are present, but these analytes appear to be confined to the area along the northern border of the Greys Landfill SSA. The measured concentrations are within low µg/L ranges. The presence of metals in groundwater in this area may be related to baseline levels of metals that are expected to be present at the facility.

4.2.2 Intermediate Groundwater Zone

4.2.2.1 Volatile Organic Compounds

No VOCs were detected in the intermediate groundwater zone of Greys Landfill during the N&E sampling events. The maximum benzene concentration encountered during the RSC and the N&E

activities was encountered at GL17-PZM032 at an estimated concentration of 0.97 ug/L, which is below the laboratory reporting limit of 1 ug/L.

Based on a review of the groundwater results from the RSC and the N&E groundwater studies, it appears that the vertical extent of COPI VOCs is confined to the shallow groundwater zone.

4.2.2.2 Semi-Volatile Organic Compounds

No SVOCs were detected in the intermediate groundwater zone of Greys Landfill during the N&E sampling events. The maximum naphthalene concentration encountered during the RSC and the N&E activities was encountered at GL17-PZM032 at a concentration of 14 ug/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the intermediate groundwater zone is isolated near GL17. The SVOC concentrations at all other locations sampled in the lower zone are below or approaching the laboratory reporting limits.

4.2.2.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the intermediate groundwater of Greys Landfill during the N&E study. Analytical results for arsenic and thallium, the most commonly detected metals, are shown on Figure 4-4. The maximum arsenic concentration during the N&E activities was detected in the intermediate zone at GL02-PZM028 at 90 µg/L. The maximum thallium concentration detected in the intermediate zone is 1.3 (total) µg/L in GL18-PZM039. Both GL02 and G118 are located along the northern border of the Greys Landfill SSA.

Other COPI analytes detected during the N&E study in the Greys Landfill SSA include cyanide and sulfide. All available cyanide concentrations are equal to or below the laboratory reporting limit. The maximum sulfide concentration detected in the intermediate zone is 8,000 µg/L in GL18-PZP002, located near the northeast of the Greys Landfill SSA boundary.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E studies, a limited presence of metals, including arsenic and thallium, exists, but, these analytes appear to be confined to the area along the northern border of the Greys Landfill SSA. The measured concentrations are within low µg/L ranges. The presence of metals in groundwater in this area may be related to baseline levels of metals that are expected to be present at the facility.

4.3 HUMPHREY IMPOUNDMENT/ TIN MILL CANAL/ FINISHING MILLS

Analytical results for detected analytes of samples collected during the N&E field activities at the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSA are presented in Tables 4-4 (VOCs), 4-5 (SVOCs) and 4-6 (Metals and Miscellaneous Analytes). Additionally, Tables D-5 through D-8 located in Appendix D present complete analytical results for groundwater samples collected during the RSC study and all subsequent N&E groundwater sampling events for comparison.

4.3.1 Shallow Groundwater Zone

4.3.1.1 Volatile Organic Compounds

Nine VOCs were detected in the shallow groundwater zone within the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs during the N&E sampling events. These VOCs include 1,1,1-trichloroethene (4.5 µg/L), 1,1-DCA (4.9 µg/L), acetone (17 µg/L), benzene (610 µg/L), bromoform (1.9 µg/L), chloroform (6.6 µg/L), ethylbenzene (19 µg/L), toluene (6.1 µg/L) and total xylene (42 µg/L). All of these VOCs except bromoform were also detected during the RSC. Carbon disulfide methylene chloride and, vinyl chloride were detected during the RSC but not during the N&E sampling rounds.

The VOCs detected most frequently at elevated concentrations during the RSC and N&E studies in the shallow groundwater zone of the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs are 1,1-DCA and benzene. Analytical results are shown on Figure 4-5. The maximum concentrations of benzene were detected at TM04-PZM006 at a concentration of 610 µg/L during the July 2004 groundwater sampling event. The maximum concentration of 1,1-DCA detected is 4.9 µg/L in FM03-PZM005, located near the southeast corner of the Finishing Mills SSA.

The benzene and 1,1-DCA concentrations in HI08-PZM003, which is located along the shoreline west of the three SSAs are below the laboratory reporting limit. The benzene and 1,1-DCA concentrations in piezometers located south of the three SSAs (TM02, TM05, FM01 and FM05) are all below 5 µg/L. The benzene and 1,1-DCA concentrations in piezometers located southeast of the three SSAs at the shoreline (SW10 and TS10) are below the laboratory reporting limits (1 µg/L). The benzene and 1,1-DCA concentrations in piezometers located east of the three SSAs (FM05, FM04 and TM18) are all below 5 µg/L. The benzene and 1,1-DCA concentrations in piezometers located north of the three SSAs (TM14, TM12, TM10 and HI04) are all below 5 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the shallow zone is generally confined to the area isolated near TM04. The Tin Mill Canal is located within a piezometric low within the shallow groundwater zone. The VOC concentrations show a decrease in piezometers located away from the Tin Mill Canal SSA

4.3.1.2 Semi-Volatile Organic Compounds

Review of shallow analytical results for groundwater samples collected during the N&E within the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs indicate occasional detections of several SVOCs. These include 2,4-dimethylphenol (14 µg/L), naphthalene (51 µg/L), bis(2-ethylexyl)phthalate (28 µg/L), phenol (25 µg/L) and 4-methylphenol, 3-methylphenol (370 µg/L). Analytical results for the most frequently occurring SVOC (naphthalene) in the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs are shown on Figure 4-5. The highest concentration of naphthalene detected during the July 2004 groundwater sampling event was located at TM04-PZM006 at a concentration of 51 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the shallow zone is generally isolated in the area along Tin Mill Canal and in the southeast corner of the Finishing Mills SSA at FM05. The Tin Mill Canal is located within a piezometric low within the shallow groundwater zone. The SVOC concentrations show a general decrease in piezometers located away from the Tin Mill Canal SSA. The SVOC concentrations in piezometers surrounding FM05 (FM03, FM02, TS10 and SW10) are below or approaching laboratory reporting limits.

4.3.1.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the shallow groundwater associated with Humphrey Impoundment, Tin Mill Canal and the Finishing Mills during the N&E study. Analytical results for chromium, lead thallium, and vanadium are shown on Figure 4-6. This analyte list represents the most commonly occurring metals of concern identified during the RSC SWI study (Fall 2001). The maximum vanadium concentrations detected during the N&E activities in the shallow zone were located at HI08-PZM003 at 170 µg/L. The maximum thallium concentrations were detected at HI07-PZM005 at 2.6 µg/L. The maximum lead concentrations were detected at FM03-PZM005 at 1 µg/L. Chromium concentrations were below the laboratory reporting limits for all samples collected during the N&E activities.

Other COPI analytes measured during the N&E study in the three SSAs include available cyanide and sulfide. All available cyanide concentrations were below the laboratory reporting limits. The maximum sulfide concentration detected in the shallow zone is 11,000 µg/L in TS10-PDM008, located southeast of the three SSAs.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, metals including lead, vanadium and chromium are present in the shallow groundwater. Vanadium appears to be the most prevalent across the Site with the highest concentrations occurring near the Tin Mill Canal SSA. The measured concentrations of lead, chromium and thallium are within low µg/L ranges. The presence of metals in groundwater in this area may be related to baseline levels of metals that are expected to be present at the facility.

4.3.2 Intermediate Groundwater Zone

4.3.2.1 Volatile Organic Compounds

One piezometer within the intermediate groundwater zone (TM09-PZM047) in the Humphrey Impoundment, Tin Mill Canal and Finishing Mills SSAs was sampled during the N&E activities. Acetone was detected in TM09-PZM047 at a concentration of 5.9 µg/L. All other VOC concentrations at TM09-PZM047 are below the laboratory reporting limits.

The VOCs detected most frequently in the intermediate groundwater zone of the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs during the RSC and the N&E activities are benzene and 1,1-DCA. Results are shown on Figure 4-7. The maximum concentrations of benzene were detected during the RSC at TM04-PZM028 at a concentration of 1200 µg/L. Benzene concentrations decrease to less than 5 µg/L in all directions from TM04. The maximum

concentration of 1,1-DCA was detected during RSC at FM03-PZM026 at 1900 µg/L. The 1,1-DCA concentrations were below laboratory reporting limits for all other samples collected from the intermediate zone during the RSC and the N&E activities.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the intermediate zone is generally confined to the Tin Mill Canal SSA near TM04 and an isolated area near FM03 in the Finishing Mills SSA. The Tin Mill Canal is located within a piezometric low within the shallow and intermediate groundwater zones. The VOC concentrations show a general decrease in piezometers located away from the Tin Mill Canal.

4.3.2.2 Semi-Volatile Organic Compounds

One piezometer within the intermediate groundwater zone (TM09-PZM047) in the Humphrey Impoundment, Tin Mill Canal and Finishing Mills SSAs was sampled during the N&E activities. Review of analytical results for groundwater samples collected from TM09-PZM047 indicate the presence of four SVOCs at concentrations above the laboratory reporting limit, including: 2,4-dimethylphenol (1700 µg/L), 2-methylphenol (47 µg/L), phenol (1600 µg/L) and 4-methylphenol, 3-methylphenol (1600 µg/L).

The SVOC detected most frequently in the shallow groundwater zone of the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs during the RSC and the N&E activities is naphthalene. Results are shown on Figure 4-7. The maximum concentration of naphthalene, 240 µg/L, was detected during the RSC at HI07PZM032. The elevated naphthalene concentrations within the intermediate zone were isolated to the Humphrey Impoundment SSA. The naphthalene concentrations in piezometers located downgradient of the Humphrey Impoundment SSA (TM03, TM05, TM06, TM07, TM08, and HI04) were all less than 10 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the intermediate zone is generally confined to the Humphrey Impoundment SSA. Groundwater impacted with naphthalene has migrated downgradient of the SSA boundary to the south and southeast (toward the Tin Mill Canal), but shows an order of magnitude decrease from 240 µg/L at HI07-PZM032 to less than 10 µg/L at all downgradient piezometers. The Tin Mill Canal is located within a piezometric low within the shallow and intermediate groundwater zones. The SVOC concentrations show a general decrease in piezometers located away from the Tin Mill Canal SSA.

4.3.2.3 Inorganic Compounds – Metals and Others

One piezometer within the intermediate groundwater zone (TM09-PZM047) in the Humphrey Impoundment, Tin Mill Canal and Finishing Mills SSAs was sampled during the N&E activities. Analytical results for samples collected during the N&E and the RSC for chromium, lead, thallium, and vanadium within the intermediate zone are shown on Figure 4-8. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum vanadium concentrations detected during both the N&E and RSC activities are located at HI07-PZM032 at 60.2 µg/L. The maximum thallium concentrations were detected at TM06-

PZM034 at 36.5 µg/L. The maximum lead concentrations were detected at FM02-PZM033 at 2.7 µg/L. The maximum chromium concentrations were detected at HI04-PZM034 at 5.2 µg/L.

Other COPI analytes measured during the N&E study in the three SSAs include available cyanide and sulfide. All available cyanide concentrations were below the laboratory reporting limits. The maximum sulfide concentration detected in the intermediate zone is 4300 µg/L in FM04-PZM036, located near the east boundary of the Finishing Mills SSA.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a limited presence of metals including arsenic, vanadium, thallium, chromium, and lead are present in the intermediate zone. The measured concentrations show a general decrease compared to the shallow zone and are within low µg/L ranges. The presence of metals in groundwater in this area may be related to baseline levels of metals that are expected to be present at the facility.

4.3.3 Lower Groundwater Zone

4.3.3.1 Volatile Organic Compounds

Three VOCs were detected in the lower groundwater zone within the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs during the N&E sampling events. These VOCs include acetone (5.9 µg/L), benzene (11 µg/L), and toluene (1 µg/L). The VOCs detected most frequently during the RSC in Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs are 1,1-DCA and benzene. Results are shown on Figure 4-9. The maximum concentration of benzene in the lower zone during the N&E activities was detected at TM04-PZM0082 (83 µg/L) in the Fall 2002 sampling event. A subsequent groundwater sample collected from TM03-PZM082 in July 2004 showed 11 µg/L. The 1,1-DCA concentrations of all samples collected from the lower zone were below the laboratory reporting limits.

Based on a review of the groundwater results from the RSC and the N&E study, it appears that the VOC impact to groundwater in the deep zone is isolated in the area near TM04. The concentrations within TM04-PZM082 are approaching the laboratory detection limit. All other benzene concentrations of samples collected from the lower zone are below 5 µg/L or the laboratory reporting limit.

4.3.3.2 Semi-Volatile Organic Compounds

Analytical results for the most frequently-occurring SVOC (naphthalene) in the Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs are shown on Figure 4-9. The highest concentration of naphthalene detected during the Fall 2002 groundwater sampling event was located at TM04-PZM082 at a concentration of 42 µg/L. A subsequent groundwater sample collected from TM04-PZM082 in July 2004, showed 11 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the lower groundwater zone is isolated to the area at TM04 near the Tin Mill Canal SSA. The SVOC concentrations at all other locations sampled in the

lower zone are below or approaching the laboratory reporting limits, including the location at TM09, which showed the presence of several SVOCs in the intermediate zone.

4.3.3.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the lower groundwater zone of Humphrey Impoundment, Tin Mill Canal and the Finishing Mills SSAs during the N&E study. Analytical results for chromium, lead, thallium, and vanadium are shown on Figure 4-10. The maximum chromium concentrations detected in the lower zone during the N&E activities were detected in TM04-PZM056 at 6.4 µg/L. A sample collected from the lower zone at TM04-PZM082 showed chromium concentrations are below the laboratory reporting limit. The maximum lead concentration detected in the lower zone is 3.3 (total) µg/L in FM03-PZM082. The maximum thallium concentration detected in the lower zone is 7 (total) µg/L in TM09-PZM067. The maximum vanadium concentration detected in the lower zone is 23.7 (total) µg/L in TM04-PZM056. A sample collected from the lower zone at TM04-PZM082 showed vanadium concentrations are below the laboratory reporting limit.

Other COPI analytes measured during the N&E study in the Greys Landfill SSA include cyanide and sulfide. All available cyanide concentrations are below the laboratory reporting limit. The maximum sulfide concentration detected in the lower zone is 2700 µg/L in TM09-PZM067, located along Tin Mill Canal.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a limited presence of metals including chromium, lead, thallium and vanadium are present in the lower zone. The measured concentrations are all within low µg/L ranges. The presence of metals in groundwater in this area at these concentrations may be related to baseline levels of metals that are expected to be present in the natural soils at the facility.

4.4 COKE OVEN AREA

Analytical results for detected analytes of samples collected during the N&E field activities at the Coke Oven SSA are presented in Tables 4-7 (VOCs), 4-8 (SVOCs) and 4-9 (Metals and Miscellaneous Analytes). Additionally, Tables D-9 through D-12 located in Appendix D present complete analytical results for groundwater samples collected during the RSC study and all subsequent N&E groundwater sampling events for comparison

4.4.1 Shallow Groundwater Zone

4.4.1.1 Volatile Organic Compounds

Four VOCs were commonly detected in the shallow groundwater zone of the Coke Oven SSA during the N&E sampling events. These VOCs and maximum concentrations detected include: benzene (1,100,000 µg/L), toluene (71,000 µg/L), ethylbenzene (1,200 µg/L), and total xylene (6,400 µg/L). The VOC detected most frequently (benzene) in the shallow groundwater zone of the Coke Oven SSA is shown on Figure 4-11.

Maximum concentrations of benzene detected in the shallow zone is 1,100,000 µg/L benzene at CO18-PZM006, which is located in the northwest corner of the Coke Oven SSA. Generally, the highest concentrations of VOCs, predominately the benzene, toluene, ethylbenzene and xylenes (BTEX) parameters, are located near the northwest corner of the Coke Oven SSA and the area west of the Coke Oven SSA. Elevated concentrations of BTEX are detected in all of the shallow piezometers west of the Coke Oven SSA to the extent of piezometers located near the shoreline of the Patapsco River. The benzene concentrations along the shoreline west of the Coke Oven SSA range from 54,000 µg/L at CO30-PZM015 to 25 µg/L at CO29-PZM010.

The benzene concentration in CO32-PZM004 (16 µg/L) located southwest of the Coke Oven SSA shows a five order of magnitude decrease compared to the source area. The benzene concentrations in piezometers located south and southeast of the Coke Oven SSA at SW18-PZM008 (110 µg/L) and CO35-PZM013 (180 µg/L) show four orders of magnitude decrease and indicate a decreasing trend from the source area.

The VOC impacted groundwater extends to the shoreline east of the Coke Oven SSA as well. Benzene concentrations of 520 µg/L and 480 µg/L were detected in CO10-PZM006 and CO26-PZM007, respectively, which are located along the shoreline of the Turning Basin.

The VOC concentrations in the two piezometers (SW13-PZM 003 and SW14-PZM004) located upgradient (north) of the Coke Oven SSA are all below the laboratory reporting limits, with the exception of chloroform at 1.5 µg/L in SW13-PZM003.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the shallow zone is highest near the northwest corner or the SSA and to the area west of the SSA to the shoreline. VOC impacted groundwater has migrated to the east to the shoreline near the Turning Basin and to the south, but shows a five order of magnitude decrease from the source area. VOC impacted groundwater does not appear to have migrated to the north of the Coke Oven SSA boundary in the shallow groundwater zone.

4.4.1.2 Semi-Volatile Organic Compounds

Seven SVOCs were detected in the shallow groundwater zone of the Coke Oven SSA during the N&E study, including: 2,4-dimethylphenol (550 µg/L), 2-methylnaphthalene (230 µg/L), 2-methylphenol (550 µg/L), 4-methylphenol,3-methylphenol (460 µg/L), naphthalene (4,800 µg/L), phenanthrene (35 µg/L) and phenol (390 µg/L). Analytical results for the most frequently-occurring SVOC, naphthalene, are shown on Figure 4-11. The maximum naphthalene concentration detected in the shallow zone, 4,800 µg/L, is in CO26-PZM007, which is located just southeast of the Coke Oven SSA near the shoreline of the Turning Basin. Elevated SVOC concentrations also extend west of the Coke Oven SSA to the western shoreline with the Patapsco River. The SVOC concentrations in the two piezometers (SW13-PZM 003 and SW14-PZM004) located upgradient of the Coke Oven SSA are all below the laboratory reporting limit, with the exception of bis(2-ethylhexyl)phthalate at 13 µg/L in SW13-PZM003.

Based on a review of the RSC and N&E groundwater data, the higher concentrations of naphthalene and SVOCs occur in the center and eastern half of the Coke Oven SSA to the

shoreline of the Turning Basin. Shallow zone groundwater samples collected throughout the SSA and to the east contain varying concentrations of naphthalene with no apparent trend. It appears that SVOC impacted groundwater has not migrated north of the Coke Oven SSA boundary.

4.4.1.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the shallow groundwater associated with the Coke Oven SSA. Analytical results for arsenic, lead and vanadium are shown on Figure 4-12. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum arsenic concentrations were detected in the shallow zone at SW13-PZM003 at 5 µg/L. The maximum lead concentration detected in the shallow zone is 18 (total) µg/L in CO18-PZM006. The maximum vanadium concentration detected in the shallow zone is 2300 (total) µg/L in CO10-PZM006.

Other COPI analytes measured during the N&E study in the Coke Oven SSA include available cyanide and sulfide. The maximum concentration of available cyanide was detected in CO27-PZM012 (350 µg/L), which is located near the northwest of the Coke Oven SSA. The maximum sulfide concentration detected in the shallow zone is 24,000 µg/L also in CO27-PZM012.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a presence of metals including arsenic, lead and vanadium are present in the shallow zone. Total lead concentrations were elevated in two locations, CO18-PZM006 (18 µg/L) and CO17-PZM005 (16 µg/L). However, in both locations the dissolved concentration was below the laboratory reporting limit indicating that the total lead concentration may have been influenced by suspended solids in the sample. The measured concentrations of arsenic are within low µg/L ranges. Vanadium appears to be more prevalent across the southern portion of the Coke Oven SSA. With the exception of Vanadium, the metal concentration along the shoreline near the Coke Oven SSA were near or approaching the laboratory reporting limit. The presence of the metals in the groundwater in this SSA at these concentrations may be related to baseline levels of metals that are expected to be present in the fill materials at the facility.

4.4.2 Intermediate Groundwater Zone

4.4.2.1 Volatile Organic Compounds

Four VOCs were commonly detected in the intermediate groundwater zone of Coke Oven SSA during the N&E sampling events. These VOCs and maximum concentrations detected include: benzene (390,000 µg/L) toluene (49,000 µg/L), ethylbenzene (950 µg/L), and total xylene (10,000 µg/L). The VOC detected most frequently (benzene) in the intermediate groundwater zone of the Coke Oven SSA is shown on Figure 4-13.

The maximum concentration of benzene detected in the intermediate groundwater zone is 390,000 µg/L benzene at CO27-PZM046, which is located along the shoreline of the Patapsco River toward the graving dock northwest of the Coke Oven SSA. Generally, the highest

concentrations of VOCs detected within the intermediate zone are located northwest of the Coke Oven SSA along the shoreline in the direction of the graving dock.

The benzene concentration in CO32-PZM041 located southwest of the Coke Oven SSA was below the laboratory reporting limit of 1 µg/L. The benzene concentration of the closest piezometer sampled within the intermediate zone located south of Coke Oven SSA (CP08-PZM034) was below the laboratory limit of 1 µg/L. To the east, a benzene concentration of 33 µg/L was detected in CO10-PZM029 located along the shoreline of the Turning Basin. The intermediate benzene concentration at CO10 represents an order of magnitude decrease from the shallow piezometer concentration of 520 µg/L.

The VOC concentration in the piezometer (SW13-PZM025) located upgradient (north) of the Coke Oven SSA is below the laboratory reporting limits.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the intermediate zone is highest near the northwest of the Coke Oven SSA in the direction of the graving dock. Benzene concentrations along the east Coke Oven SSA boundary (CO06-PZM039, CO10-PZM029 and CO26-PZM032) decreased to concentrations of less than 5 ug/L. VOC impacted groundwater does not appear to have migrated to the southwest or north within the intermediate groundwater zone.

4.4.2.2 Semi-Volatile Organic Compounds

Seven SVOCs were frequently detected in the intermediate groundwater zone associated with the Coke Oven SSA during the N&E study, including: 2,4-dimethylphenol (94 µg/L) 2-methylnaphthalene (230 µg/L), 2-methylphenol (420 µg/L), 4-methylphenol,3-methylphenol (390 µg/L), naphthalene (3500 µg/L), phenanthrene (46 µg/L), phenol (930 µg/L) and bis(2ethylhexyl)phthalate (72 µg/L). Analytical results for the most frequently-occurring SVOC, naphthalene, are shown on Figure 4-13.

The maximum naphthalene concentration detected in the intermediate zone, 3,500 µg/L, is in CO08-PZM036, which is located within the west center portion of the Coke Oven SSA. Elevated SVOC concentrations also extend west of the Coke Oven SSA to the western shoreline with the Patapsco River. The SVOC concentrations in the piezometer (SW13-PZM 025) located upgradient of the Coke Oven SSA are all below the laboratory reporting, with the exception of bis(2-ethylexyl)phthalate at 5.9 µg/L.

Based on a review of the RSC and N&E groundwater data, naphthalene and SVOCs have impacted the intermediate groundwater zone. The areal extent is similar to that described in the shallow zone. SVOC concentrations show a decrease from the shallow zone concentrations, with the exception of the area northwest of Coke Oven SSA towards the graving dock.

4.4.2.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the intermediate groundwater zone of the Coke Oven SSA during the N&E study. Analytical results for arsenic, lead and

vanadium are shown on Figure 4-14. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum arsenic concentrations were detected in the intermediate zone at CO28-PZM048 at 190 µg/L. The maximum lead concentration was detected at in CO02-PZM041 at (146 µg/L). However, the dissolved lead concentration at the same location was less than the reporting limit of 1 µg/L. The maximum vanadium concentration detected in the intermediate zone is 280 (total) µg/L in CO10-PZM029.

Other COPI analytes measured during the N&E study in the Coke Oven SSA include available cyanide and sulfide. The maximum concentration of available cyanide was detected in CO08-PZM036 (1800 µg/L), which is located in the center of the Coke Oven SSA. The maximum sulfide concentration detected in the shallow zone is 57,000 µg/L also in CO08-PZM036.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a presence of metals including arsenic, lead and vanadium are present in the intermediate zone. The elevated arsenic concentrations are isolated to area northwest of the Coke Oven SSA. Total lead concentrations were elevated in one location, CO02-PZM041 (146 µg/L). However, the dissolved concentration was below the laboratory reporting limit indicating that the total lead concentration may have been influenced by suspended solids in the sample. Vanadium concentrations showed a decrease to near reporting limit concentrations at all locations with the exception of CO10-PZM029.

4.4.3 Lower Groundwater Zone

4.4.3.1 Volatile Organic Compounds

Three VOCs were detected in the lower groundwater zone of Coke Oven SSA during the N&E sampling events. These VOCs and maximum concentrations detected include: benzene (53 µg/L) toluene (38 µg/L) and total xylene (41 µg/L). The VOC detected most frequently (benzene) in the shallow groundwater zone of the Coke Oven SSA is shown on Figure 4-15.

The maximum concentration of benzene detected in the lower groundwater zone is 53 µg/L benzene at CO33-PZM141, which is located in the northwest portion of the Coke Oven SSA.

The benzene concentration in CO29-PZM51 located west of the Coke Oven SSA along the shoreline is 5.7 µg/L. The benzene concentration of the closest piezometer to the southern Coke Oven SSA boundary within the deep groundwater zone (SW18-PZM114) was 4.9 µg/L. To the east, benzene concentrations in CO10-PZM090 (1 µg/L) and CO35-PZM056 (3 µg/L) are both approaching the laboratory reporting limit.

The VOC concentrations in the piezometers located upgradient (SW13-PZM025 and SW14-PZM099) (north) of the Coke Oven SSA are both below the laboratory reporting limit of 1 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the deep groundwater zone is limited to the area in the northwest portion of the Coke Oven SSA. VOC impacted groundwater in the deep groundwater zone is below or approaching the laboratory reporting limits.

4.4.3.2 Semi-Volatile Organic Compounds

The naphthalene and SVOC concentrations showed a 5 order of magnitude decrease from the shallow to the intermediate water zone. The concentrations at all deeper locations in the lower zone indicate the SVOC concentrations are approaching or are below the laboratory reporting limits.

4.4.3.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the lower groundwater zone associated with the Coke Oven SSA during the N&E study. Analytical results for arsenic, lead and vanadium are shown on Figure 4-16. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum arsenic concentrations were detected in the lower zone at SW17-PZM113 at 26 µg/L. The maximum lead concentration was detected at in CO35-PZM056 at (50 µg/L). However, the dissolved lead concentration at the same location was less than the reporting limit of 1 µg/L. The maximum vanadium concentration detected in the intermediate zone is 69 (total) µg/L in both, CO28-PZM125 and CO35-PZM056.

Other COPI analytes measured during the N&E study in the Coke Oven SSA include available cyanide and sulfide. All concentration of available cyanide were below the laboratory reporting limit. The maximum sulfide concentration detected in the lower zone is 3500 µg/L also in SW18-PZM114.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a limited presence of metals including arsenic, lead and vanadium are present, but, the measured concentrations are within low µg/L ranges. The presence of metals in groundwater in this area may be related to baseline levels of metals that are expected to be present in native soils at the facility.

4.5 COKE POINT LANDFILL

Analytical results for detected analytes of samples collected during the N&E field activities at the Coke Point Landfill SSA are presented in Tables 4-10 (VOCs), 4-11 (SVOCs) and 4-12 (Metals and Miscellaneous Analytes). Additionally, Tables D-13 through D-16 located in Appendix D present complete analytical results for groundwater samples collected during the RSC study and all subsequent N&E groundwater sampling events for comparison

4.5.1 Shallow Groundwater Zone

4.5.1.1 Volatile Organic Compounds

Ten COPI VOCs were detected in the shallow piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI VOCs hits only are presented in Tables 4-10. The four most commonly occurring VOCs at the Coke Point SSA during the N&E activities, as well as, the maximum concentration detected, include: acetone (260 µg/L); benzene (12,000 µg/L); toluene (3700 µg/L); and total xylene (2300 µg/L). All of these VOCs were also detected during the RSC. The VOCs detected most frequently at elevated concentrations in the shallow groundwater zone of the Coke Point Landfill SSA are benzene and toluene, which are shown on Figure 4-17. The maximum concentration of benzene detected is 12,000 µg/L in CP08-PZM008, located at the east boundary of the SSA.

Elevated concentrations of COPI VOCs, predominately benzene and toluene, are detected in the shallow piezometers along the shoreline to the east, south and west of the Coke Point Landfill SSA. The benzene concentrations along the west shoreline of the SSA range from 15 µg/L at CP09-PZM010 to 62 µg/L at CP05-PZM019. Benzene along the southern shoreline range from 15 µg/L at CP15-PZM020 to 100 µg/L at CP12-PZM012.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the shallow zone is highest CP08 near the east boundary of the Coke Point Landfill SSA. VOC impacted groundwater has migrated to the shoreline to the east south and west, but shows a two order of magnitude decrease from the source area in all directions.

4.5.1.2 Semi-Volatile Organic Compounds

Twelve COPI SVOCs were detected in the shallow piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI SVOCs hits only are presented in Tables 4-11. The seven most commonly occurring SVOCs at the Coke Point SSA during the N&E activities, as well as, the maximum concentration detected, include: 2,4-dimethylphenol (42 µg/L), 2-methylnaphthalene (24 µg/L), 2-methylphenol (41 µg/L), 4-methylphenol,3-methylphenol (100 µg/L), naphthalene (450 µg/L), phenanthrene (21 µg/L) and phenol (370 µg/L). Analytical results for the most frequently-occurring SVOC at elevated concentrations, naphthalene, are shown on Figure 4-17. The maximum naphthalene concentration (450 µg/L) during the N&E activities was detected at CP08-PZM008, which is located along the east boundary of the Coke Point SSA.

Elevated concentrations of COPI SVOCs, predominately naphthalene, were detected in the shallow piezometers along the shoreline to the east, south and west of the Coke Point SSA. The naphthalene concentrations along the west shoreline of the SSA range from 99 µg/L at CP09-PZM010 to 31 µg/L at CP05-PZM019. Naphthalene concentrations along the southern shoreline range from 140 µg/L at CP15-PZM020 to 34 µg/L at CP14-PZM009.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the shallow zone is highest CP08 near the east boundary of

the Coke Point Landfill SSA. SVOC impacted groundwater has migrated to the shoreline to the east south and west of the Coke Point Landfill SSA.

4.5.1.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the shallow groundwater zone associated with Coke Point Landfill during the N&E study. Analytical results for arsenic, lead, chromium and vanadium are shown on Figure 4-18. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum arsenic concentrations were detected in the shallow zone at CP06-PZM009 at 25 µg/L. The maximum total lead concentration detected in the shallow zone is 34 (total) µg/L in CP17-PZM013. The maximum chromium concentration detected in the shallow zone is 30 (total) µg/L in CP09-PZM010. The maximum vanadium concentration detected in the shallow zone is 26 (total) µg/L in CP08-PZM008.

Other COPI analytes measured during the N&E study in the Coke Point Landfill SSA include available cyanide and sulfide. All available cyanide concentrations are below the laboratory reporting limits. The maximum sulfide concentration detected in the shallow zone is 16,000 µg/L also in CP16-PZM018.

During the RSC assessment, high concentrations of total lead and total chromium were detected in CP03, CP05 and CP10. These three locations were resampled for COPI total and dissolved metals during the June 2004 N&E activities. The June 2004 results showed the total and dissolved lead and chromium concentrations at these three locations were all in the low µg/L range (less than 10) or below the laboratory reporting limit.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E studies, a low concentration of total and dissolved metals are present at isolated locations in the shallow groundwater. The total and dissolved lead and chromium concentrations were below or approaching the laboratory reporting limit indicating that the elevated total lead and chromium concentrations detected during the RSC may have been influenced by suspended solids (turbidity) in the samples collected during the RSC sampling event. The measured concentrations of the COPI metals detected in the Coke Point Landfill SSA during the N&E activities are within low µg/L ranges. The presence of the metals in the groundwater in this SSA at these concentrations may be related to baseline levels of metals that are expected to be present in the fill materials at the facility.

4.5.2 Intermediate Groundwater Zone

4.5.2.1 Volatile Organic Compounds

Six COPI VOCs were detected in the intermediate piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI VOCs hits only are presented in Table 4-10. The four most commonly occurring VOCs at the Coke Point Landfill SSA during the N&E activities, as well as, the maximum concentration detected, include: acetone (51 µg/L), benzene (150 µg/L), toluene (50 µg/L), and total xylene (28 µg/L). The maximum concentration of benzene detected is 150 µg/L in CP05-PZM028, located at the west boundary and shoreline of the SSA.

Elevated concentrations of COPI VOCs, predominately benzene and toluene, were detected in the piezometers along the shoreline to the east (CP05-PZM028 at 150 µg/L) and south of the Coke Point Landfill SSA (CP16-PZM035 at 89 µg/L). The benzene concentrations have decreased to less than the reporting limit in several locations within the intermediate zone.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to groundwater in the intermediate zone is confined to the area closest to the west and southern shoreline of the Coke Point Landfill SSA. All other locations are at or approaching the laboratory limits.

4.5.2.2 Semi-Volatile Organic Compounds

Thirteen COPI SVOCs were detected in the intermediate piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI SVOCs hits only are presented in Tables 4-11. The seven most commonly occurring SVOCs at the Coke Point Landfill SSA during the N&E activities, as well as, the maximum concentration detected, include: 2,4-dimethylphenol (26 µg/L), 2-methylnaphthalene (63 µg/L), 2-methylphenol (29 µg/L), 4-methylphenol,3-methylphenol (50 µg/L), bis(2-ethylhexyl)phthalate (210 µg/L), naphthalene (1300 µg/L), phenanthrene (11 µg/L) and phenol (260 µg/L). Analytical results for the most frequently-occurring SVOC at elevated concentrations, naphthalene, are shown on Figure 4-19. The maximum naphthalene concentration (1300 µg/L) during the N&E activities was detected at CP05-PZM028, which is located along the west shoreline boundary of the Coke Point Landfill SSA.

Elevated concentrations of COPI SVOCs, predominately naphthalene are detected in the intermediate piezometers along the shoreline to the west (CP05-PZM028 at 1300 µg/L) and south (CP16-PZM at 58 µg/L) of Coke Point Landfill.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the intermediate zone is confined to the area closest to the west and southern shoreline of the Coke Point Landfill SSA. All other locations are at or approaching the laboratory reporting limits.

4.5.2.3 Inorganic Compounds – Metals and Others

Review of analytical results for groundwater samples collected during the N&E study indicate low concentrations of total and dissolved metals are present in the intermediate groundwater. Analytical results for arsenic, lead, chromium and vanadium are shown on Figure 4-20. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum total arsenic concentrations were detected in the intermediate zone at CP15-PZM042 at 24 µg/L. The maximum total lead concentration detected in the intermediate zone is 1.6 µg/L in CP05-PZM028. The maximum total chromium concentration detected in the intermediate zone is 6.4 µg/L in CP03-PZM025. The maximum total vanadium concentration detected in the intermediate zone is 4 µg/L in CP03-PZM025.

Other COPI analytes measured during the N&E study in the Coke Point Landfill SSA include available cyanide and sulfide. All available cyanide concentrations are below the laboratory

reporting limits. The maximum sulfide concentration detected in the shallow zone is 18,000 µg/L also in CP05-PZM028.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a low concentration of total and dissolved metals are present at isolated locations in the intermediate groundwater. The measured concentrations of the COPI metals detected in the Coke Point Landfill SSA during the N&E activities are within low µg/L ranges. The presence of the metals in the groundwater in this SSA at these concentrations may be related to baseline levels of metals that are expected to be present in the native materials at the facility.

4.5.3 Lower Groundwater Zone

4.5.3.1 Volatile Organic Compounds

Four COPI VOCs were detected in the lower zone piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI VOCs hits only are presented in Table 4-10. The four most commonly occurring VOCs at the Coke Point Landfill SSA during the N&E activities, as well as, the maximum concentration detected in the lower zone, include: acetone (7400 µg/L), benzene (1 µg/L), toluene (0.8 µg/L), and total xylene (less than 2 µg/L). The maximum concentration of benzene detected is 1 µg/L in CP09-PZM047, located at the southwest boundary and shoreline of the Coke Point Landfill SSA.

All COPI VOCs, with the exception of acetone, are at or below the laboratory reporting limit. The benzene concentrations have decreased to less than the reporting limit in several locations within the lower zone. High acetone concentrations were observed at two locations CP17 and CP14. However, no obvious pattern of occurrence for acetone was observed at the Coke Point Landfill or Coke Oven SSAs. The acetone occurrences may be present at these isolated locations or they may be potential laboratory contaminants. The possibility exists that the acetone occurrences may be derived from the use of coated bentonite pellets in the construction of these specific wells.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC impact to the groundwater in the Coke Point Landfill SSA is limited to the shallow and intermediate groundwater zones.

4.5.3.2 Semi-Volatile Organic Compounds

Eight COPI SVOCs were detected in the lower piezometers at the Coke Point Landfill SSA during the N&E activities. The COPI SVOC hits only are presented in Table 4-11. The seven most commonly occurring SVOCs at the Coke Point Landfill SSA during the N&E activities, as well as, the maximum concentration detected, include: 2,4-dimethylphenol (less than 10 µg/L), 2-methylnaphthalene (less than 10 µg/L), 2-methylphenol (less than 10 µg/L), 4-methylphenol,3-methylphenol (5.7 µg/L), bis(2-ethylhexyl)phthalate (23 µg/L), naphthalene (20 µg/L), phenanthrene (23 µg/L) and phenol (31 µg/L). Analytical results for the most frequently-occurring SVOC at elevated concentrations, naphthalene, are shown on Figure 4-21. The maximum naphthalene concentration (20 µg/L) during the N&E activities was detected at CP09-

PZM047, which is located along the southwest shoreline boundary of the Coke Point Landfill SSA.

Elevated concentrations of COPI SVOCs were generally detected in CP09, which is located near the top of the lower groundwater zone. The COPI SVOC concentrations samples collected from the deeper piezometers within the Coke Point Landfill SSA are all below or approaching the laboratory reporting limit of 10 µg/L.

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the SVOC impact to groundwater in the intermediate zone is limited to concentrations at or approaching the laboratory reporting limits.

4.5.3.3 Inorganic Compounds – Metals and Others

Low concentrations of total and dissolved metals were detected in the lower groundwater zone associated with Coke Point Landfill during the N&E study. Analytical results for arsenic, lead, chromium and vanadium are shown on Figure 4-22. This analyte list represents the most commonly occurring metals of concern identified during the RSC study (Fall 2001). The maximum total arsenic concentrations were detected in the lower zone at CP09-PZM047 at 29 µg/L. The maximum total lead concentration detected in the lower zone is 4.6 µg/L in CP17-PZM058. The total chromium concentrations were all below the laboratory reporting limits. The maximum total vanadium concentration detected in the intermediate zone is 40 µg/L in CP05-PZM128.

The dissolved vanadium concentration for the sample collected from CP05-PZM128 was less than the laboratory reporting limit of 5 µg/L, indicating that the total vanadium concentration may have been influenced by a slightly turbid sample.

Other COPI analytes measured during the N&E study in the Coke Point Landfill SSA include available cyanide and sulfide. All available cyanide concentrations are below the laboratory reporting limits. The maximum sulfide concentration detected in the shallow zone is 4800 µg/L also in CP09-PZM047.

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E study, a low concentration of total and dissolved metals are present at isolated locations in the lower groundwater. The measured concentrations of the COPI metals detected in the Coke Point Landfill SSA during the N&E activities are within low µg/L ranges. The presence of the metals in the groundwater in this SSA at these concentrations may be related to baseline levels of metals that are expected to be present in the native materials at the facility.

**SECTION FOUR
TABLES**

**Table 4-1
Detected VOCs in Groundwater
Nature & Extent Investigation
Greys Landfill SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | GL03 | | GL18 | | GL19 | | GL20 | | |
|--------------------|-------------|-------------|-------------|--------------|-----------|-------------|-----------|--------------------------|-------|
| | PZP001 | PZM013 | PZP002 | PZM039 | PZM003 | PZM004 | PZM004 | PZM004 | |
| | Shallow | Shallow | Shallow | Intermediate | Shallow | Shallow | Shallow | Shallow | |
| | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 (duplicates) | |
| 1,1-Dichloroethane | 1 U | 1 U | 170 | 1 U | 1 U | 1 U | 9.9 | 4.8 | 5.2 |
| Benzene | 2.4 | 43 | 1500 | 1 U | 5.2 | 0.6 J | 38 | 19 | 20 |
| Bromoform | 1 U | 1 U | 10 U | 1 U | -- | 2.8 | -- | 1 U | 1 U |
| Ethylbenzene | 1 U | 1 U | 9 J | 1 U | 1 U | 1 U | 1 | 1 U | 1 U |
| Tetrachloroethene | 1 U | 1 U | 10 U | 1 U | 13 | 4.9 | 1 U | 1 U | 1 U |
| Toluene | 0.5 J | 0.6 J | 290 | 1 U | 1 U | 1 U | 2 | 1.2 U | 1.2 U |
| Xylene, total | 1 U | 1 U | 140 | 1 U | 1 UJ | 1 U | 2.3 | 1.8 | 1.9 |

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

R Unreliable result. Analyte may or may not be present in the sample.

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ Not detected, quantitation limit may be inaccurate or imprecise.

UL Not detected, quantitation limit is probably higher.

D Result reported from a secondary dilution.

-- Not analyzed.

**Table 4-2
Detected SVOCs in Groundwater
Nature & Extent Investigation
Greys Landfill SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | GL03 | | GL18 | | GL19 | | GL20 | |
|----------------------------|------------------------|------------------------|------------------------|-----------------------------|----------------------|------------------------|-----------|--------------------------|
| | PZP001 | PZM013 | PZF002 | PZM039 | PZM003 | PZM004 | PZM004 | |
| | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Fall 2002 | Shallow Summer 2004 | Fall 2002 | Summer 2004 (duplicates) |
| 2,4-Dimethylphenol | 10 U | 10 U | 740 D | 10 U | -- | 10 U | -- | 110 |
| 2-Methylnaphthalene | 10 U | 10 U | 160 | 10 U | -- | 10 U | -- | 10 U |
| 2-Methylphenol | 10 U | 10 U | 360 D | 10 U | -- | 10 U | -- | 14 |
| 3- & 4-Methylphenol | 10 U | 10 U | 1000 D | 10 U | -- | 10 U | -- | 11 |
| Acenaphthene | 10 U | 10 U | 24 | 10 U | -- | 10 U | -- | 10 U |
| Acenaphthylene | 10 U | 10 U | 120 | 10 U | -- | 10 U | -- | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | 10 U | 10 U | 10 U | -- | 18 | -- | 10 U |
| Dibenzofuran | 10 U | 10 U | 54 | 10 U | -- | 10 U | -- | 10 U |
| Fluoranthene | 10 U | 10 U | 11 | 10 U | -- | 10 U | -- | 10 U |
| Fluorene | 10 U | 10 U | 55 | 10 U | -- | 10 U | -- | 10 U |
| Naphthalene | 5.2 J | 67 | 2000 D | 10 U | 1 U* | 10 U | 54* | 16 |
| Phenanthrene | 10 U | 10 U | 73 | 10 U | -- | 10 U | -- | 10 U |
| Phenol | 10 U | 10 U | 490 D | 10 U | -- | 10 U | -- | 10 U |
| Pyrene | 10 U | 10 U | 13 | 10 U | -- | 10 U | -- | 10 U |
| Pyridine | 20 U | 20 U | 42 | 20 U | -- | 20 U | -- | 20 U |

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

R Unreliable result. Analyte may or may not be present in the sample.

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ Not detected, quantitation limit may be inaccurate or imprecise.

UL Not detected, quantitation limit is probably higher.

D Result reported from a secondary dilution.

-- Not analyzed.

* The naphthalene analyses of the Fall 2002 samples were performed by Method 8260A.



**Table 4-3
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Greys Landfill SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | GL02 | | | GL03 | | | GL18 | | | GL19 | | | GL20 | | |
|---------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-------------------------------------|-------------------------------------|
| | PZM006 | PZM017 | PZM028 | PZP001 | PZM013 | PZP002 | PZM039 | PZM003 | PZM004 | PZM003 | PZM004 | PZM004 | PZM004 | PZM004 | PZM004 |
| | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 (duplicates) | Shallow Summer 2004 (duplicates) |
| Arsenic | 6.2 | 16 | 90 | 5 U | 5 J | 11 | 22 | 3 J | 3 J | 3 J | 3 U | 3 J | 3 J | 3 J | 3 J |
| Barium | 22 | 79 | 130 | 61 | 28 | 62 | 350 | 17 | 17 | 17 | 38 | 38 | 38 | 38 | 38 |
| Cobalt | 1.2 | 8.8 | 2.3 | 1 U | 2.4 | 2 | 6 | 1 | 1 | 1 | 0.5 J | 1 | 1 | 1 U | 1 U |
| Copper | 4.4 K | 3.7 | 8.6 | 4.3 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Lead | 1.4 | 1 U | 1.2 | 9.7 | 1 U | 1 U | 1 U | 1.1 | 1.1 | 1.1 | 2.1 | 2.1 | 2.1 | 2.4 | 2.4 |
| Nickel | 30 | 11 | 12 | 5 | 4.1 | 37 | 3.8 | 14 | 14 | 14 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 |
| Selenium | 8.6 | 19 | 38 | 5 U | 8.6 U | 13 | 7.8 U | 6.4 | 6.4 | 6.4 | 5 U | 5 U | 5 U | 5 U | 5 U |
| Thallium | 1.4 U | 1 U | 1 U | 0.6 J | 0.8 J | 7.8 | 1.3 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tin | 520 J | 140 | 390 | 540 | 280 | 1600 | 170 | 1300 | 1300 | 1300 | 20 U | 20 U | 20 U | 20 U | 20 U |
| Vanadium | 24 U | 5 U | 5 U | 15 U | 11 U | 59 | 5 U | 57 | 57 | 57 | 7.7 U | 7.7 U | 7.7 U | 12 U | 12 U |
| Zinc | 87 K | 14 | 16 | 10 U | 10 U | 9 J | 10 U | 9 J | 9 J | 9 J | 10 U | 10 U | 10 U | 6 J | 6 J |
| Arsenic, dissolved | 6.8 | 15 | 91 | 5 U | 4 J | 11 | 22 | 5 U | 5 U | 5 U | 3 J | 3 J | 3 J | 3 J | 3 J |
| Barium, dissolved | 24 | 79 | 130 | 60 | 25 | 60 | 350 | 17 | 17 | 17 | 39 | 39 | 39 | 39 | 39 |
| Cobalt, dissolved | 1.2 | 8.8 | 2.2 | 1 U | 2.3 | 2 | 5.7 | 0.9 J | 0.9 J | 0.9 J | 1 U | 1 U | 1 U | 0.9 J | 0.9 J |
| Copper, dissolved | 3.5 K | 3.4 | 8.2 | 3.1 | 2 U | 2 U | 4.2 | 2 J | 2 J | 2 J | 2 U | 2 U | 2 U | 2 U | 2 U |
| Lead, dissolved | 0.7 J | 1 U | 1 U | 1.1 | 1 U | 1 U | 2.5 | 0.8 J | 0.8 J | 0.8 J | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| Nickel, dissolved | 30 | 11 | 12 | 4.9 | 3.6 | 37 | 3.9 | 15 | 15 | 15 | 2.5 | 2.5 | 2.5 | 2.7 | 2.7 |
| Selenium, dissolved | 9 | 19 | 37 | 5 U | 7 U | 14 | 8.9 U | 5.4 | 5.4 | 5.4 | 5 U | 5 U | 5 U | 5 U | 5 U |
| Tin, dissolved | 540 J | 140 | 380 | 550 | 270 | 1600 | 190 | 1300 | 1300 | 1300 | 30 | 30 | 30 | 20 U | 20 U |
| Vanadium, dissolved | 23 K | 5 U | 5 U | 12 | 5 U | 60 | 5 U | 52 U | 52 U | 52 U | 11 U | 11 U | 11 U | 17 U | 17 U |
| Zinc, dissolved | 36 K | 14 | 6 J | 10 U | 10 U | 6 J | 6 J | 10 | 10 | 10 | 10 U | 10 U | 10 U | 110 | 110 |
| Cyanide, available | -- | -- | -- | 2 U | 2 J | 23 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Cyanide, total | -- | -- | -- | 26 | 140 | 750 | 8.6 | 21 | 21 | 21 | 140 | 140 | 140 | 130 | 130 |
| Sulfide | -- | -- | -- | 1500 L | 19000 L | 21000 L | 8000 L | 1000 UL | 1000 UL | 1000 UL | 8000 L | 8000 L | 8000 L | -- | -- |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-4
 Detected VOCs in Groundwater
 Nature & Extent Investigation
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | HI05 | | HI07 | | HI08 | | TM04 | | TM05 | | | | |
|-----------------------|-----------|-------------|-----------|-------------|-------------|-------------|-------------|-------------|-----------|-------------|-------------|-----------|-------------|
| | PZM108 | | PZM094 | | PZM003 | | PZM060 | | PZM006 | | | | |
| | Lower | Shallow | Lower | Shallow | Lower | Shallow | Lower | Shallow | Lower | Shallow | | | |
| | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 |
| 1,1,1-Trichloroethane | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 5 U |
| 1,1-Dichloroethane | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 5 U |
| Acetone | 100 U | 6.8 | - | 3.1 J | 3.3 J | 3.4 J | 3.4 J | 17 J | - | 17 J | 5 U | 5 U | 100 U |
| Benzene | 5 U | 16 | 1 U | 1 U | 1 U | 1 U | 1 U | 610 | 83 | 610 | 11 | 11 | 5 U |
| Bromoform | 5 U | 1 U | - | 1 U | 1.9 | 1 U | 1 U | 5 U | -- | 5 U | 1 U | 1 U | 5 U |
| Chloroform | 5 U | 1 U | -- | 1 U | 1 U | 1 U | 1 U | 5 U | -- | 5 U | 1 U | 1 U | 5 U |
| Ethylbenzene | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 19 | 5 | 19 | 1 U | 1 U | 5 U |
| Toluene | 5 U | 4.6 | 1 U | 0.8 J | 1 U | 1 U | 1 U | 6.1 | 0.8 J | 6.1 | 0.7 J | 0.7 J | 5 U |
| Trichloroethene | 5 U | 1 UL | 1 U | 1 UL | 1 U | 1 UL | 1 U | 1 U | 5 U |
| Xylene, total | 10 U | 5.6 | 1 UJ | 1 U | 1 U | 1 U | 1 U | 42 | 3.2 | 42 | 0.5 J | 0.5 J | 10 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-4
**Detected VOCs in Groundwater
 Nature & Extent Investigation
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
 ISG Sparrows Point, Inc.**

| Analyte, µg/L | TM09 | | | | TM15 | | FM03 | | SW10 | | TS10 |
|-----------------------|-------------|--------------|-----------|-------------|-----------|-----------|-------------|-------------|-------------|-------------|-------|
| | PZM007 | PZM047 | PZM067 | | PZM065 | PZM082 | | PZM012 | | PDM008 | |
| | Shallow | Intermediate | Lower | | Lower | Lower | | Shallow | | Shallow | |
| | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Fall 2002 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | |
| 1,1,1-Trichloroethane | 1 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethane | 1.9 | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Acetone | 11 | 5.9 | -- | 5 U | 100 U | -- | 3.7 U | 5 U | 5 U | 5.7 U | 5.7 U |
| Benzene | 1 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromoform | 1 U | 1 U | -- | 1 U | 5 U | -- | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroform | 1 U | 1 U | -- | 1 U | 5 U | -- | 1 U | 1 U | 2.9 U | 1 U | 1 U |
| Ethylbenzene | 1 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Toluene | 0.5 J | 1 U | 1 U | 1 J | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | 1 UL | 1 UL | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Xylene, total | 1 U | 1 U | 1 UJ | 1 U | 10 U | 1 UJ | 1 U | 1 U | 1 U | 1 U | 1 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-5
 Detected SVOCs in Groundwater
 Nature & Extent Investigation
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | HI05 | | HI07 | | HI08 | | TM04 | | TM05 | |
|----------------------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| | PZM108 | PZM005 | PZM094 | PZM003 | PZM060 | PZM006 | PZM082 | PZM069 | | |
| | Lower | Shallow | Lower | Shallow | Lower | Shallow | Lower | Lower | Lower | Lower |
| | Fall 2002 | Summer 2004 |
| 2,4-Dimethylphenol | 10 U | 14 | -- | 10 U |
| 2-Methylphenol | 10 U | 10 U | -- | 10 U |
| 3- & 4-Methylphenol | -- | 8.2 J | -- | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | 10 U | -- | 10 U |
| Naphthalene | 10 U | 16 | 1 U | 10 U | 1 U | 10 U | 42 | 11 | 10 U | 10 U |
| Phenol | 10 U | 10 U | -- | 10 U | -- | 10 U | -- | 28 | -- | 10 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

**Table 4-5
Detected SVOCs in Groundwater
Nature & Extent Investigation
Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | TM09 | | | | TM15 | | FM03 | | SW10 | | TS10 | |
|----------------------------|-------------|--------------|-----------|-------------|-----------|-----------|-------------|-----------|-------------|-------------|-------------|-------------|
| | PZM007 | | PZM067 | | PZM065 | | PZM005 | | PZM012 | | PDM008 | |
| | Shallow | Intermediate | Lower | Lower | Lower | Shallow | Lower | Shallow | Shallow | Shallow | Shallow | |
| | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 |
| 2,4-Dimethylphenol | 500 D | 1700 D | - | 10 U | 10 U | 10 U | 10 U | - | 10 U | 10 U | 10 U | 10 U |
| 2-Methylphenol | 16 | 47 | - | 10 U | 10 U | 10 U | 10 U | - | 10 U | 10 U | 10 U | 10 U |
| 3- & 4-Methylphenol | 370 D | 1600 D | - | 10 U | - | - | 10 U | - | 10 U | 10 U | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | 10 U | - | 10 | 10 U | 10 U | 10 U | - | 5.2 J | 10 U | 10 U | 10 U |
| Naphthalene | 9.2 J | 10 U | 1 U | 10 U | 10 U | 1 U | 10 U | 1 U | 10 U | 10 U | 10 U | 10 U |
| Phenol | 25 | 1600 D | - | 10 U | 10 U | 10 U | 10 U | - | 10 U | 10 U | 10 U | 10 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.



**Table 4-6
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | HI07 | | HI08 | | TM04 | | TM09 | |
|----------------------|------------------------|----------------------|----------------------|------------------------|------------------------|-----------------------------|------------------------|-----------------------------|
| | PZM005 | PZM094 | PZM060 | PZM003 | PZM006 | PZM082 | PZM007 | PZM047 |
| | Shallow Summer 2004 | Lower Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 |
| Antimony | 2 U | 2 U | 2 U | 2.3 U | 2 U | 2.1 | 2 U | 2 U |
| Arsenic | 5 U | 18 | 6.5 | 5.7 | 5 U | 5 U | 5 U | 4 J |
| Barium | 110 | 91 | 180 | 35 | 32 | 110 | 65 | 640 |
| Beryllium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cadmium | 1 U | 1 U | 1 U | 1 U | 2.3 | 1 U | 1 U | 1 U |
| Chromium | 13 U | 4.5 U | 3.1 U | 11 U | 9.2 U | 6.2 U | 8.7 U | 4.4 U |
| Cobalt | 0.7 J | 31 | 1.3 | 0.6 J | 0.8 J | 1.3 | 1 U | 1 J |
| Copper | 2 J | 16 | 3.7 | 6 | 2 U | 4.4 | 2.8 | 5.8 |
| Iron | 100 U | 42000 | 59000 | 70 J | 210 | 6900 | 100 J | 77000 |
| Lead | 1 U | 1 J | 1 U | 1 U | 1 U | 1.1 | 1 U | 0.5 J |
| Nickel | 13 | 32 | 6.8 U | 6 U | 12 | 8.1 U | 6.4 | 9.3 |
| Selenium | 5 J | 32 | 6.6 | 8.6 | 5 U | 7 | 5 U | 13 |
| Thallium | 2.6 | 1.1 | 1 U | 1 U | 1 U | 1 U | 1.5 U | 1 U |
| Tin | 730 | 540 | 440 | 310 | 360 | 460 | 380 | 550 |
| Vanadium | 20 | 5 U | 5 U | 170 | 5 U | 5 U | 120 | 5 U |
| Zinc | 10 U | 36 | 10 U | 10 U | 10 U | 10 U | 14 U | 10 U |
| Antimony, dissolved | 2 U | 2 U | 2 U | 2.2 U | 2 U | 2 U | 2 U | 2 U |
| Arsenic, dissolved | 5 U | 17 | 8.3 | 6 | 5 U | 3 J | 5 U | 3 J |
| Barium, dissolved | 110 | 85 | 180 | 34 | 32 | 98 | 67 | 610 |
| Beryllium, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chromium, dissolved | 12 U | 3.5 U | 3.1 U | 11 U | 10 U | 5.6 U | 8.8 U | 3.5 U |
| Cobalt, dissolved | 0.7 J | 31 | 1 | 0.5 J | 0.8 J | 0.7 J | 0.5 J | 0.8 J |
| Copper, dissolved | 2 U | 13 | 3.3 | 4.8 | 2 U | 3.3 | 10 | 5.4 |
| Lead, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Nickel, dissolved | 13 | 32 | 6.2 U | 6.1 U | 12 | 7.3 U | 6.8 | 9.1 U |
| Selenium, dissolved | 5 U | 34 | 7.4 | 6.9 | 5 U | 6.5 | 5 U | 14 |
| Thallium, dissolved | 1.6 | 0.8 J | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tin, dissolved | 770 | 590 | 460 | 300 | 380 | 400 | 370 | 500 |
| Vanadium, dissolved | 29 | 5 U | 5 U | 170 | 5 U | 5 U | 130 | 5 U |
| Zinc, dissolved | 10 U | 31 | 10 U | 12 U | 10 U | 10 U | 13 U | 10 U |
| Cyanide, total | 20 | 1.8 | 4.1 | 21 | 95 | 46 | 96 | 5.2 U |
| Sulfide | 1000 UL | 1000 U | 1000 UL | 1000 UL | 1400 L | 1000 UL | 4400 L | 8100 L |
| | | | | | | | | 2700 L |

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

R Unreliable result. Analyte may or may not be present in the sample.

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UF Not detected, quantification limit may be inaccurate or imprecise.

UL Not detected, quantification limit is probably higher.

D Result reported from a secondary dilution.

-- Not analyzed.



Table 4-6
 Detected Metals and Miscellaneous Analytes in Groundwater
 Nature & Extent Investigation
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | FM03 | | SW10 | | TS10 | |
|----------------------|------------------------|----------------------|------------------------|------------------------|---------|--|
| | PZM005 | PZM082 | PZM012 | PDM008 | | |
| | Shallow Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | | |
| Antimony | 2 U | 2 U | 2 U | 2 U | 2 U | |
| Arsenic | 5 U | 6.3 | 5 U | 5 U | 5 U | |
| Barium | 9.2 | 65 | 30 | 36 | 36 | |
| Beryllium | 9.3 L | 1 U | 0.9 L | 1 UL | 1 UL | |
| Cadmium | 5.9 U | 1.7 U | 2 U | 1.7 U | 1.7 U | |
| Chromium | 40 U | 13 U | 7.6 U | 12 U | 12 U | |
| Cobalt | 57 | 1.4 | 37 | 1 U | 1 U | |
| Copper | 210 K | 3.5 K | 2 U | 2 U | 2 U | |
| Iron | -- | -- | -- | -- | -- | |
| Lead | 1 | 3.3 | 1 U | 1 U | 1 U | |
| Nickel | 270 | 2.2 | 58 | 3.6 | 3.6 | |
| Selenium | 5 U | 5 U | 5 U | 5 U | 5 U | |
| Thallium | 1.6 U | 2.2 U | 1 U | 1 U | 1 U | |
| Tin | 1400 J | 53 J | 35 J | 200 J | 200 J | |
| Vanadium | 58 | 13 U | 5 U | 5.5 U | 5.5 U | |
| Zinc | 1400 K | 22 K | 100 K | 10 U | 10 U | |
| Antimony, dissolved | 2 U | 2 U | 2 U | 4.3 | 4.3 | |
| Arsenic, dissolved | 5 U | 6.1 | 5 U | 5 U | 5 U | |
| Barium, dissolved | 9.2 | 51 | 30 | 36 | 36 | |
| Beryllium, dissolved | 9.6 L | 1 UL | 0.8 L | 1 UL | 1 UL | |
| Chromium, dissolved | 39 U | 9.1 U | 11 U | 12 U | 12 U | |
| Cobalt, dissolved | 56 | 0.5 J | 34 | 1 U | 1 U | |
| Copper, dissolved | 210 K | 28 K | 2 K | 2 U | 2 U | |
| Lead, dissolved | 1 J | 3.1 | 1 U | 1 U | 1 U | |
| Nickel, dissolved | 270 | 1 J | 54 | 3.5 | 3.5 | |
| Selenium, dissolved | 5 U | 5 U | 5 U | 5 U | 5 U | |
| Thallium, dissolved | 9.7 U | 1.6 U | 1 U | 2.5 U | 2.5 U | |
| Tin, dissolved | 1400 J | 53 J | 39 J | 220 J | 220 J | |
| Vanadium, dissolved | 54 K | 5 U | 5.8 U | 10 U | 10 U | |
| Zinc, dissolved | 1400 K | 30 U | 94 K | 10 U | 10 U | |
| Cyanide, total | 1.5 | 4.1 | 1.6 | 4.1 | 4.1 | |
| Sulfide | 1000 UL | 1000 UL | 1000 UL | 11000 L | 11000 L | |

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
 UJ Not detected, quantitation limit may be inaccurate or imprecise.
 UL Not detected, quantitation limit is probably higher.
 D Result reported from a secondary dilution.
 -- Not analyzed.

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
 R Unreliable result. Analyte may or may not be present in the sample.
 J Analyte present. Reported value may not be accurate or precise.
 K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

**Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | CO02 | | | | CO08 | | | | CO10 | | | | CO17 |
|--------------------|------------------------|-----------------------------|-----------------------------|--------------------|------------------------|--------------------|-----------------------------|----------------------|------------------------|--------------------|-----------------------------|----------------------|------------------------|
| | PZM006 | PZM041 | PZM036 | PZM098 | PZM006 | PZM098 | PZM029 | PZM090 | PZM006 | PZM098 | PZM029 | PZM090 | PZM005 |
| | Shallow Summer 2004 | Intermediate Summer 2004 | Intermediate Summer 2004 | Lower Fall 2002 | Shallow Summer 2004 | Lower Fall 2002 | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Lower Fall 2002 | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 |
| 1,1-Dichloroethane | 100 U | 50 U | 100 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 100 U |
| 2-Butanone | 500 U | 250 U | 500 U | -- | 5.2 U | -- | 5.1 U | -- | 5.2 U | -- | 5.1 U | 5 U | 500 U |
| Acetone | 560 U | 250 U | 500 U | -- | 20 U | -- | 21 U | -- | 20 U | -- | 21 U | 8.2 U | 500 U |
| Benzene | 790000 D | 32000 D | 12000 | 1 U | 520 | 1 U | 33 | 1 U | 520 | 1 U | 33 | 1.3 | 28000 D |
| Carbon disulfide | 100 U | 50 U | 100 U | -- | 1 U | -- | 1 U | -- | 1 U | -- | 1 U | 1 U | 100 U |
| Chlorobenzene | 100 U | 50 U | 100 U | 1 U | 0.9 J | 1 U | 1 U | 1 U | 0.9 J | 1 U | 1 U | 1 U | 100 U |
| Chloroform | 100 U | 50 U | 100 U | -- | 1 U | -- | 1 U | -- | 1 U | -- | 1 U | 1 U | 100 U |
| Ethylbenzene | 750 | 30 J | 950 | 1 U | 8.2 | 1 U | 1 U | 1 U | 8.2 | 1 U | 1 U | 1 U | 460 |
| Methylene chloride | 600 U | 270 U | 600 U | 1 U | 4.7 U | 1 U | 2.8 U | 1 U | 4.7 U | 1 U | 2.8 U | 3 U | 640 U |
| Tetrachloroethene | 100 U | 50 U | 100 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 100 U |
| Toluene | 48000 D | 30 J | 10000 | 1 U | 65 | 1 U | 2 | 1 U | 65 | 1 U | 2 | 1.2 | 840 |
| Xylenes, total | 6400 | 100 U | 10000 | 1 UJ | 86 | 1 UJ | 3.7 | 1 UJ | 86 | 1 UJ | 3.7 | 2 U | 870 |

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- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CO18 | | | CO26 | | | CO27 | | |
|--------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|
| | PZM006 | | | PZM032 | | | PZM046 | | |
| | Shallow | | | Lower | | | Intermediate | | |
| | Summer 2004 | Summer 2004 | Summer 2004 |
| 1,1-Dichloroethane | 1000 U | 5 U | 5 U | 1 U | 5 U | 330 U | 1.0 U | 1.0 U | 1 U |
| 2-Butanone | 5000 U | 19 U | 18 U | 5 U | 25 U | 1700 U | -- | -- | 6.6 |
| Acetone | 5000 U | 50 U | 38 U | 5 U | 130 U | 1700 U | -- | -- | 110 U |
| Benzene | 1100000 D | 540 | 480 | 2.5 | 42000 D | 390000 D | 5.4 | 15 | 3.2 |
| Carbon disulfide | 1000 U | 5 U | 5 U | 1 U | 5 U | 330 U | -- | -- | 1 U |
| Chlorobenzene | 1000 U | 5 U | 5 U | 1 U | 5 U | 330 U | 1.0 U | 1.0 U | 1 U |
| Chloroform | 1000 U | 5 U | 5 U | 1 U | 5 U | 330 U | -- | -- | 1 U |
| Ethylbenzene | 1000 U | 18 | 16 | 1 U | 110 | 600 | 1.0 U | 1.0 U | 1 U |
| Methylene chloride | 6300 U | 17 U | 14 U | 4.5 U | 5 U | 1100 U | 1.0 U | 1.0 U | 11 U |
| Tetrachloroethene | 1000 U | 5 U | 5 U | 1 U | 5 U | 330 U | 1.0 U | 1.0 U | 1 U |
| Toluene | 71000 | 260 | 230 | 2 | 5800 D | 49000 | 0.9 J | 0.6 J | 1 U |
| Xylene, total | 4600 | 430 | 390 | 2.5 | 1000 | 9200 | 2.0 U | 2.0 U | 1 U |

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- Not analyzed.

**Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | CO28 | | | | CO29 | | | CO30 | | |
|--------------------|----------------------------------|---------------------------------------|--------------------------------|----------------------------------|--------------------------------|----------------------------------|-----------|--------------|-------------|--|
| | PZM010 Shallow Summer 2004 | PZM048 Intermediate Summer 2004 | PZM125 Lower Summer 2004 | PZM040 Shallow Summer 2004 | PZM051 Lower Summer 2004 | PZM015 Shallow Summer 2004 | Fall 2002 | Fall 2002(2) | Summer 2004 | |
| | | | | | | | | | | |
| 1,1-Dichloroethane | 1 U | 100 U | 1 U | 1 U | 1 U | 100 U | 1.0 U | 1.0 U | 1 U | |
| 2-Butanone | 5 U | 500 U | 5.2 U | 5 U | 5 U | 500 U | -- | -- | 5 U | |
| Acetone | 5 U | 500 U | 8.2 U | 23 U | 6.7 U | 500 U | -- | -- | 7.1 U | |
| Benzene | 2000 D | 350000 D | 4.9 | 25 | 5.7 | 54000 D | 17 | 27 | 4.1 | |
| Carbon disulfide | 1 U | 100 U | 1 U | 1 U | 1 U | 100 U | -- | -- | 1 U | |
| Chlorobenzene | 1 U | 100 U | 1 U | 1 U | 1 U | 100 U | 1.0 U | 1.0 U | 1 U | |
| Chloroform | 1 | 100 U | 1 U | 1 U | 1 U | 100 U | -- | -- | 1 U | |
| Ethylbenzene | 7.8 | 250 | 1 U | 3 | 1 U | 80 J | 1.0 U | 1.0 U | 1 U | |
| Methylene chloride | 4.5 U | 430 U | 7.6 U | 4.3 U | 4.9 U | 510 U | 1.0 U | 4.3 | 6.3 U | |
| Tetrachloroethene | 1 U | 100 U | 1 U | 0.5 J | 1 U | 100 U | 1.0 U | 1.0 U | 1 U | |
| Toluene | 130 | 28000 D | 1.7 | 8.4 | 1.3 | 6300 | 2.7 | 6.5 | 1.5 | |
| Xylenes, total | 99 | 4600 | 2 U | 24 | 2 U | 1700 | 2.0 U | 2.0 U | 2 U | |

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- J Analyte present. Reported value may not be accurate or precise.
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- Not analyzed.

Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CO32 | | | CO35 | | | SW10 | | | SW13 | | |
|--------------------|---------|--------------|--------|---------|--------|---------|---------|-------------|-----------|-------------|--|--|
| | PZM004 | PZM041 | PZM141 | PZM013 | PZM056 | PZM012 | PZM003 | PZM025 | | | | |
| | Shallow | Intermediate | Lower | Shallow | Lower | Shallow | Shallow | Summer 2004 | Fall 2002 | Summer 2004 | | |
| 1,1-Dichloroethane | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | | |
| 2-Butanone | 5 U | 5 U | 5 U | 25 U | 5 U | 5 U | 5 U | -- | -- | 5 U | | |
| Acetone | 9.1 U | 5 U | 5.3 U | 25 U | 140 | 5 U | 8.3 U | -- | -- | 5 U | | |
| Benzene | 16 | 1 U | 53 | 180 | 3.3 | 1 U | 1 U | 1 U | 1 U | 1 U | | |
| Carbon disulfide | 1 U | 1 U | 1 U | 5 U | 2.3 | 1 U | 1 U | -- | -- | 1 U | | |
| Chlorobenzene | 1 U | 1 U | 1 U | 5 U | 1 U | 1 UL | 1 U | 1 U | 1 U | 1 U | | |
| Chloroform | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1.5 | -- | -- | 1 U | | |
| Ethylbenzene | 1 U | 1 U | 1 U | 5 J | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | | |
| Methylene chloride | 3 U | 1.9 U | 4.6 U | 15 U | 4.3 U | 1 U | 10 U | 1 U | 1 U | 3.1 U | | |
| Tetrachloroethene | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | | |
| Toluene | 1.8 | 1 | 1.1 | 44 | 1.5 J | 1 U | 0.9 J | 1 U | 1 U | 1 U | | |
| Xylene, total | 2 J | 1 U | 2 U | 85 | 2 J | 1 U | 2 U | 1 UJ | 1 UJ | 1 U | | |

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- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
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- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

**Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | SW13 | | | | SW14 | | | | SW17 | | | |
|--------------------|-----------|-------------|---------------------|-------------|-----------|-------------|-------------|-------------|--------------|-------------|-----------|-------------|
| | PZM111 | | PZM004 (duplicates) | | PZM099 | | PZM007 | | PZM038 | | PZM113 | |
| | Lower | | Shallow | | Lower | | Shallow | | Intermediate | | Lower | |
| | Fall 2002 | Summer 2004 | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 |
| 1,1-Dichloroethane | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 1 U | 100 U | 330 U | 1 U | 1 U | 1 U |
| 2-Butanone | 100 U | 5 U | 5 U | 5.1 U | 100 U | 5 U | 500 U | 1700 U | 1700 U | -- | 5 U | 5 U |
| Acetone | 100 U | 10 U | 5 U | 6.8 U | 100 U | 7.7 U | 500 U | 1700 U | 1700 U | -- | 7.3 U | 7.3 U |
| Benzene | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 20000 | 54000 | 54000 | 1 U | 1 U | 2.6 |
| Carbon disulfide | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 100 U | 330 U | 330 U | -- | 1 U | 1 U |
| Chlorobenzene | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 100 U | 330 U | 330 U | 1 U | 1 U | 1 U |
| Chloroform | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 100 U | 330 U | 330 U | -- | 1 U | 1 U |
| Ethylbenzene | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 100 U | 330 U | 330 U | 1 U | 1 U | 1 U |
| Methylene chloride | 5 U | 19 U | 3.6 U | 3.2 U | 5 U | 5.6 U | 680 U | 1300 U | 1300 U | 1.8 U | 7.7 U | 7.7 U |
| Tetrachloroethene | 5 U | 1 U | 1 U | 1 U | 5 U | 1 U | 100 U | 330 U | 330 U | 1 U | 1 U | 1 U |
| Toluene | 5 U | 0.8 J | 1 U | 1 U | 5 U | 1 U | 2500 | 330 U | 330 U | 1 U | 0.6 J | 0.6 J |
| Xylene, total | 10 U | 1 U | 2 U | 2 U | 5 U | 2 U | 590 | 330 U | 330 U | 1 U | 2 U | 2 U |

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J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ Not detected, quantitation limit may be inaccurate or imprecise.

UL Not detected, quantitation limit is probably higher.

D Result reported from a secondary dilution.

-- Not analyzed.



Table 4-7
Detected VOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | SW18 | | | | | | TS05 PPM007 Shallow |
|--------------------|---------------------|-------|-----------|--|-------------|-------|---------------------------|
| | PZM008 (duplicates) | | PZM114 | | | | |
| | Shallow | | Lower | | | | |
| | Summer 2004 | | Fall 2002 | | Summer 2004 | | |
| 1,1-Dichloroethane | 0.9 J | 0.9 J | 0.8 J | | 1 U | 100 U | |
| 2-Butanone | 5 U | 5 U | -- | | 5 U | 500 U | |
| Acetone | 9.1 | 6.3 B | -- | | 22 U | 700 U | |
| Benzene | 110 | 110 | 180 | | 4.9 | 360 | |
| Carbon disulfide | 1 U | 1 U | -- | | 1 U | 100 U | |
| Chlorobenzene | 1 UL | 1 U | 1 U | | 1 U | 100 U | |
| Chloroform | 1 U | 1 U | -- | | 1 U | 100 U | |
| Ethylbenzene | 3.8 | 4.1 | 2.9 | | 1.1 | 100 U | |
| Methylene chloride | 1.3 U | 1 U | 1 U | | 5.2 U | 470 U | |
| Tetrachloroethene | 1 UL | 1 U | 1 U | | 1 U | 100 U | |
| Toluene | 17 | 18 | 38 | | 3.1 | 80 J | |
| Xylene, total | 60 | 64 | 41 | | 15 | 200 U | |

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- Not analyzed.

Table 4-8
 Detected SVOCs in Groundwater
 Nature & Extent Investigation
 Coke Oven Area SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | CO02 | | | CO08 | | | CO10 | | | | | | CO17 | | CO18 | |
|----------------------------|------------------------|-----------------------------|-----------------------------|--------------------|------------------------|-----------------------------|--------------------|--------------------|----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | PZM006 | PZM041 | PZM036 | PZM098 | PZM006 | PZM029 | PZM090 | | PZM005 | | PZM006 | | PZM006 | | PZM006 | |
| | Shallow Summer 2004 | Intermediate Summer 2004 | Intermediate Summer 2004 | Lower Fall 2002 | Shallow Summer 2004 | Intermediate Summer 2004 | Lower Fall 2002 | Lower Fall 2002 | Lower Summer 2004 | Shallow Summer 2004 |
| 2,4-Dimethylphenol | 120 | 10 U | 10 U | -- | 6.2 J | 16 | -- | -- | 11 U | 10 U | 10 U | 10 U | 10 U | 10 U | 180 | |
| 2-Methylnaphthalene | 17 | 14 | 99 | -- | 22 | 10 U | -- | -- | 11 U | 23 | 10 U | 23 | 10 U | 10 U | 10 U | |
| 2-Methylphenol | 120 | 10 U | 10 U | -- | 23 | 76 | -- | -- | 11 U | 10 U | 10 U | 10 U | 10 U | 10 U | 460 | |
| 3- & 4-Methylphenol | 120 | 10 U | 42 | -- | 35 | 120 | -- | -- | 11 U | 10 U | 10 U | 10 U | 10 U | 10 U | 370 | |
| Acenaphthene | 5.4 J | 18 | 10 U | -- | 10 U | 10 U | -- | -- | 11 U | 10 U | 10 U | 9.1 J | 9.1 J | 10 U | 10 U | |
| Acenaphthylene | 10 U | 10 U | 7.3 J | -- | 8.6 J | 10 U | -- | -- | 11 U | 10 U | 10 U | 5.6 J | 5.6 J | 10 U | 10 U | |
| bis(2-Ethylhexyl)phthalate | 15 | 8.9 J | 6.1 J | -- | 10 U | 10 U | -- | -- | 11 U | 10 U | 10 U | 10 U | 10 U | 74 | | |
| Dibenzofuran | 5.2 J | 10 U | 5.4 J | -- | 6.3 J | 10 U | -- | -- | 11 U | 10 U | 10 U | 6.3 J | 6.3 J | 10 U | 10 U | |
| Fluorene | 7.3 J | 10 U | 8.6 J | -- | 5.8 J | 10 U | -- | -- | 11 U | 10 U | 10 U | 9.3 J | 9.3 J | 10 U | 10 U | |
| Naphthalene | 670 | 12 | 3500 | 1 U | 1100 D | 280 D | 1 U | 1 U | 11 U | 640 | 640 | 640 | 640 | 150 | | |
| Phenanthrene | 13 | 10 U | 10 U | -- | 16 | 10 U | -- | -- | 11 U | 16 | 10 U | 16 | 16 | 10 U | 10 U | |
| Phenol | 91 | 70 | 50 | -- | 7.4 J | 320 D | -- | -- | 11 U | 11 | 11 | 11 | 11 | 390 | | |
| Pyridine | 250 | 20 U | 20 U | -- | 43 | 13 | -- | -- | 21 U | 20 U | 20 U | 20 U | 20 U | 1100 | | |

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- D Result reported from a secondary dilution.
- Not analyzed.



Table 4-8
 Detected SVOCs in Groundwater
 Nature & Extent Investigation
 Coke Oven Area SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | CO26 | | | | | | CO27 | | | CO28 | | | |
|----------------------------|---------------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-----------|--------------|-------------|---------------------|--------------------------|
| | PZM007 (duplicates) | | PZM032 | | PZM012 | | PZM046 | | PZM122 | | | | |
| | Shallow | | Lower | | Shallow | | Intermediate | | Lower | | | | |
| | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Fall 2002 | Fall 2002(2) | Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 |
| 2,4-Dimethylphenol | 57 | 57 | 10 U | 21 | 69 | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 94 |
| 2-Methylnaphthalene | 230 D | 87 J | 10 U | 14 | 17 | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 23 |
| 2-Methylphenol | 76 | 75 | 10 U | 31 | 140 | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 420 D |
| 3- & 4-Methylphenol | 75 | 75 | 10 U | 29 | 290 D | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 390 D |
| Acenaphthene | 9.3 J | 9.9 J | 10 U | 10 U | -- | -- | 10 U | 11 U | 11 U |
| Acenaphthylene | 150 | 160 | 10 U | 10 U | -- | -- | 10 U | 11 U | 20 |
| bis(2-Ethylhexyl)phthalate | 10 U | 10 U | 9 J | 10 U | 10 U | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 72 |
| Dibenzofuran | 43 | 46 | 10 U | 10 U | -- | -- | 10 U | 11 U | 11 U |
| Fluorene | 39 | 42 | 10 U | 10 U | -- | -- | 10 U | 11 U | 11 U |
| Naphthalene | 4800 D | 5100 D | 31 | 710 D | 860 D | 10 U | 10 U | 10 U | 1.0 U | 1.0 U | 10 U | 150 | 1900 D |
| Phenanthrene | 35 | 38 | 10 U | 10 U | -- | -- | 10 U | 11 U | 11 U |
| Phenol | 52 | 51 | 10 U | 11 | 420 D | 10 U | 10 U | 10 U | -- | -- | 10 U | 11 U | 930 D |
| Pyridine | 66 | 57 | 21 U | 20 U | 130 | 20 U | 20 U | 20 U | -- | -- | 20 U | 22 U | 160 |

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- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
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- D Result reported from a secondary dilution.
- Not analyzed.



**Table 4-8
Detected SVOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | CO29 | | CO30 | | CO32 | | CO33 | | CO35 | | SW10 |
|----------------------------|--------|-------------|-----------|--------------|-------------|-------------|--------|---------|--------|---------|------|
| | PZM051 | | PZM060 | | PZM004 | PZM041 | PZM141 | PZM013 | PZM056 | PZM012 | |
| | Lower | Summer 2004 | Fall 2002 | Fall 2002(2) | Summer 2004 | Summer 2004 | Lower | Shallow | Lower | Shallow | |
| 2,4-Dimethylphenol | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 8.5 J | 11 U | 10 U | 10 U |
| 2-Methylnaphthalene | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 21 | 11 U | 10 U | 10 U |
| 2-Methylphenol | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 18 | 11 U | 10 U | 10 U |
| 3- & 4-Methylphenol | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 20 | 11 U | 10 U | 10 U |
| Acenaphthene | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 10 U | 11 U | 10 U | 10 U |
| Acenaphthylene | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 9.3 J | 11 U | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 21 | -- | -- | -- | 11 U | 41 | 11 U | 10 U | 11 U | 10 U | 10 U |
| Dibenzofuran | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 10 U | 11 U | 10 U | 10 U |
| Fluorene | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 10 U | 11 U | 10 U | 10 U |
| Naphthalene | 11 U | 1.0 U | -- | -- | 11 U | 140 | 11 U | 940 D | 7.3 J | 10 U | 10 U |
| Phenanthrene | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 10 U | 11 U | 10 U | 10 U |
| Phenol | 11 U | -- | -- | -- | 11 U | 11 U | 11 U | 19 | 11 U | 10 U | 10 U |
| Pyridine | 21 U | -- | -- | -- | 21 U | 22 U | 22 U | 28 | 22 U | 20 U | 20 U |

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- D Result reported from a secondary dilution.
- Not analyzed.



Table 4-8

Detected SVOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | SW13 | | | | SW14 | | | | | |
|----------------------------|----------------|-----------|---------------------|-----------|--------------|-----------|-----------------------------|-----------|--------------|-----------|
| | PZM003 Shallow | | PZM025 Intermediate | | PZM111 Lower | | PZM004 (duplicates) Shallow | | PZM099 Lower | |
| | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 | Summer 2004 | Fall 2002 |
| 2,4-Dimethylphenol | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| 2-Methylnaphthalene | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| 2-Methylphenol | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| 3- & 4-Methylphenol | 10 U | -- | 10 U | -- | 10 U | -- | 10 U | -- | 10 U | 10 U |
| Acenaphthene | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Acenaphthylene | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 13 | -- | 5.9 J | 10 U | 8 J | 10 U | 10 U | 10 U | 10 U | 29 U |
| Dibenzofuran | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Fluorene | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Naphthalene | 10 U | 1 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Phenanthrene | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Phenol | 10 U | -- | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Pyridine | 20 U | -- | 20 U | -- | 20 U | -- | 20 U | -- | 20 U | 20 U |

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- Not analyzed.



Table 4-8
Detected SVOCs in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | SW17 | | | SW18 | | SW18 | | TS05 PPM007 Shallow Summer 2004 |
|----------------------------|----------------------------------|---------------------------------------|------------------------------|--------------------------------|---|------------------------------|--------------------------------|--|
| | PZM007 Shallow Summer 2004 | PZM038 Intermediate Summer 2004 | PZM113 Lower Fall 2002 | PZM113 Lower Summer 2004 | PZM008 (duplicates) Shallow Summer 2004 | PZM114 Lower Fall 2002 | PZM114 Lower Summer 2004 | |
| | 10 U | 10 U | -- | 10 U | 5.2 J | -- | 5.9 J | |
| 2,4-Dimethylphenol | 10 U | 10 U | -- | 10 U | 10 U | -- | 10 U | 10 U |
| 2-Methylnaphthalene | 26 | 77 | -- | 10 U | 25 | -- | 10 U | 10 U |
| 2-Methylphenol | 21 | 10 U | -- | 10 U | 10 | -- | 10 U | 10 U |
| 3- & 4-Methylphenol | 12 | 10 U | -- | 10 U | 17 | -- | 10 U | 10 U |
| Acenaphthene | 10 U | 19 | -- | 10 U | 10 U | -- | 10 U | 10 U |
| Acenaphthylene | 16 | 74 | -- | 10 U | 10 U | -- | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | 6 J | -- | 10 U | 10 U | -- | 69 | 10 U |
| Dibenzofuran | 10 U | 27 | -- | 10 U | 10 U | -- | 10 U | 10 U |
| Fluorene | 10 U | 6.6 J | -- | 10 U | 10 U | -- | 10 U | 10 U |
| Naphthalene | 1200 | 30 | 1 U | 10 U | 890 D | 940 | 14 | 10 U |
| Phenanthrene | 10 U | 20 | -- | 10 U | 10 U | -- | 10 U | 10 U |
| Phenol | 18 | 9.4 J | -- | 10 U | 10 U | -- | 10 U | 10 U |
| Pyridine | 20 U | 20 U | -- | 20 U | 20 U | -- | 15 J | 20 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-9
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CO02 | | CO08 | | CO10 | | CO15 | | CO17 | | CO18 | |
|----------------------|------------------------|-----------------------------|-----------------------------|------------------------|-----------------------------|----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | PZM006 | PZM041 | PZM036 | PZM006 | PZM029 | PZM090 | PZM005 | PZM005 | PZM005 | PZM005 | PZM006 | PZM006 |
| | Shallow Summer 2004 | Intermediate Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 |
| Antimony | 2.2 U | 2 U | 2.3 U | 2.5 U | 2.2 U | 2 U | 2.7 U | 2.6 U | 2.6 U | 2 U | 2 U | 2 U |
| Arsenic | 5.1 U | 5.3 | 5 U | 5 U | 10 | 3 J | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Barium | 50 | 45 | 71 | 46 | 220 | 490 | 48 | 55 | 55 | 25 | 25 | 25 |
| Beryllium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chromium | 9.7 U | 7 U | 14 U | 9.2 U | 64 | 9.6 U | 8.1 U | 9.9 U | 9.9 U | 9.2 U | 9.2 U | 9.2 U |
| Cobalt | 1 U | 1.6 U | 1 U | 2 | 3.6 | 1 | 1 U | 1 U | 1 U | 1.7 | 1.7 | 1.7 |
| Copper | 2 U | 64 U | 4 U | 2 U | 17 | 3.1 | 2.3 U | 2 U | 2 U | 2.4 | 2.4 | 2.4 |
| Iron | 210 U | 26000 | -- | -- | -- | -- | -- | -- | -- | 8300 | 8300 | 8300 |
| Lead | 0.8 J | 4.5 U | 4.1 U | 1 U | 16 | 1.6 | 4.1 U | 16 | 16 | 18 | 18 | 18 |
| Nickel | 6.2 U | 6.3 U | 8.6 U | 9.5 | 15 | 5.2 | 3.8 U | 3 U | 3 U | 15 U | 15 U | 15 U |
| Selenium | 5 U | 10 | 3 J | 8.8 | 23 | 7.5 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Thallium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tin | 450 | 310 | 770 | 1100 | 970 | 410 | 220 | 83 | 83 | 1500 | 1500 | 1500 |
| Vanadium | 3 J | 5 U | 26 | 2300 | 280 | 8.4 | 3 J | 5 U | 5 U | 5 U | 5 U | 5 U |
| Zinc | 10 U | 10 U | 19 U | 5 J | 190 | 60 | 10 U | 10 U | 10 U | 47 J | 47 J | 47 J |
| Antimony, dissolved | 2 U | 2 U | 2 U | 2.4 U | 2 U | 2 U | 2.4 U | 2.4 U | 2.4 U | 3 U | 3 U | 3 U |
| Arsenic, dissolved | 3 J | 5 J | 5 U | 5 U | 7.5 | 3 J | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Barium, dissolved | 50 | 46 | 69 | 45 | 180 | 480 | 47 | 55 | 55 | 24 | 24 | 24 |
| Beryllium, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cadmium, dissolved | 1 U | 1 U | 1 U | 0.5 U | 0.5 U | 0.5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cobalt, dissolved | 1 U | 1.6 U | 1 U | 1.9 | 2.3 | 0.9 J | 1 U | 1 U | 1 U | 1.6 | 1.6 | 1.6 |
| Copper, dissolved | 2.3 U | 4.6 U | 2 U | 2 U | 5.3 | 2.3 | 2 U | 2 U | 2 U | 2.1 | 2.1 | 2.1 |
| Iron, dissolved | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead, dissolved | 0.9 J | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3.8 U | 3.8 U | 1 U | 1 U | 1 U |
| Nickel, dissolved | 6.2 U | 6.2 U | 9 U | 11 | 11 | 4.5 | 4 U | 2.9 U | 2.9 U | 14 U | 14 U | 14 U |
| Selenium, dissolved | 5 U | 9.3 | 3 J | 6.4 | 23 | 7.5 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Tin, dissolved | 420 | 300 | 740 | 1100 | 770 | 400 | 230 | 99 | 99 | 1500 | 1500 | 1500 |
| Vanadium, dissolved | 5 U | 5 U | 16 | 2200 | 170 | 5 U | 5 J | 5 U | 5 U | 5 U | 5 U | 5 U |
| Zinc, dissolved | 10 U | 10 U | 10 U | 10 U | 10 U | 18 | 10 U | 10 U | 10 U | 9 J | 9 J | 9 J |
| Alkalinity, total | 140000 | 550000 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chloride | 77000 | 980000 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cyanide, available | 6.7 L | 2 UL | 1800 K | 2.6 | 8.1 | 9.1 U | -- | 2 UL |
| Cyanide, total | 430 | 32 | 190 | 890 | 1800 | 10 U | -- | 58 | 58 | 350 | 350 | 350 |
| Methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nitrate, as N | 50 U | 50 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nitrite, as N | 3 J | 5 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfate | 530000 | 3300 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfide | 3700 L | 1000 UL | 57000 L | 1000 UL | 1200 L | 1000 UL | -- | 2600 L | 2600 L | 3200 L | 3200 L | 3200 L |



**Table 4-9
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | CO26 | | | CO27 | | | CO28 | | |
|----------------------|-------------------------------|-----------------|-------------------|------------------------|-----------------|-------------------|------------------------|-----------------|--|
| | PZM007 (duplicate) Shallow | PZM032 Lower | PZM012 Shallow | PZM046 Intermediate | PZM122 Lower | PZM010 Shallow | PZM048 Intermediate | PZM125 Lower | |
| | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | Summer 2004 | |
| Antimony | 2 U | 5.5 | 2 U | 2 U | 2 U | 8.4 U | 8.8 U | 4.7 U | |
| Arsenic | 5 U | 14 | 5 U | 87 | 5 U | 5 U | 190 | 7.6 | |
| Barium | 69 | 93 | 48 | 7.7 | 230 | 15 | 60 | 150 | |
| Beryllium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 2.3 | |
| Chromium | 9.3 U | 5.8 U | 9.5 U | 8.4 U | 6.6 U | 7.3 U | 7.8 U | 50 | |
| Cobalt | 1.9 | 3 | 0.7 U | 1 U | 1 U | 0.6 J | 0.7 J | 25 | |
| Copper | 2 U | 14 | 2.4 | 2 U | 8.4 | 2 U | 2.9 | 25 | |
| Iron | -- | -- | 140 | 170 | 72000 | 100 U | 90 J | 21000 | |
| Lead | 1 U | 1 U | 2.2 U | 1 U | 1.2 U | 1 U | 0.7 J | 12 | |
| Nickel | 16 | 20 | 8.7 U | 4.2 U | 2.9 U | 3.9 | 5.4 | 33 | |
| Selenium | 5 U | 48 | 5 U | 5 U | 5 U | 5 U | 5.7 | 5 U | |
| Thallium | 1 U | 1 U | 1 U | 1 U | 1 U | 0.6 J | 1 U | 1 U | |
| Tin | 1500 | 1300 | 550 | 260 | 110 | 110 K | 390 K | 170 K | |
| Vanadium | 330 | 5 U | 5 U | 5 U | 5 U | 19 | 18 | 69 | |
| Zinc | 10 U | 10 U | 10 | 10 U | 20 | 10 U | 10 U | 140 | |
| Antimony, dissolved | 2 U | 3.3 U | 2 U | 2.1 U | 2 U | 8.3 U | 5.7 U | 4.1 U | |
| Arsenic, dissolved | 5 U | 10 | 5 U | 98 | 5 U | 5 U | 230 | 5 U | |
| Barium, dissolved | 67 | 93 | 33 | 6.9 | 240 | 15 | 59 | 38 | |
| Beryllium, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Cadmium, dissolved | 0.5 U | 0.5 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Cobalt, dissolved | 1.8 | 2.9 | 0.6 J | 1 U | 1 U | 0.5 J | 0.6 J | 1 U | |
| Copper, dissolved | 2 U | 13 | 2.2 | 2 U | 2 U | 2.2 | 2.4 | 2 U | |
| Iron, dissolved | -- | -- | -- | -- | -- | 100 U | 140 | 90 J | |
| Lead, dissolved | 1 U | 1 U | 1.3 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Nickel, dissolved | 16 | 19 | 8.3 U | 4.4 U | 2 U | 3.6 | 5.4 | 2.1 | |
| Selenium, dissolved | 5 U | 47 | 5 U | 5 U | 5 U | 5 U | 6.1 | 5 U | |
| Tin, dissolved | 1500 | 1200 | 550 | 250 | 110 | 110 K | 370 K | 160 K | |
| Vanadium, dissolved | 300 | 5 U | 5 U | 4 J | 5 U | 19 | 13 | 3 J | |
| Zinc, dissolved | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 34 | 10 U | |
| Alkalinity, total | -- | -- | 92000 | 82000 | 45000 | -- | -- | -- | |
| Chloride | -- | -- | 380000 | 360000 | 310000 | -- | -- | -- | |
| Cyanide, available | 2 U | 2 U | 350 | 2 U | 2 U | 2 U | 2 U | 2 U | |
| Cyanide, total | 550 | 47 | 450 | 550 | 2.8 | 1 U | 1000 | 5.1 | |
| Methane | -- | -- | 2000 J | 4800 | 6600 J | -- | -- | -- | |
| Nitrate, as N | -- | -- | 50 U | 40 J | 50 U | -- | -- | -- | |
| Nitrite, as N | -- | -- | 5 U | 5 U | 4 J | -- | -- | -- | |
| Sulfate | -- | -- | 570000 | 270000 | 4300 | -- | -- | -- | |
| Sulfide | 2200 L | 1000 UL | 24000 J | 16000 J | 1000 UJ | 1000 UL | 2300 L | 3200 L | |



Table 4-9
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CO29 | | | CO30 | | | CO32 | | | CO33 | | | CO35 | | | SW10 |
|----------------------|------------------------|----------------------|----------------------|------------------------|------------------------|-----------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|----------------------|-------------|-------------|------|
| | PZM010 | PZM051 | PZM060 | PZM015 | PZM004 | PZM041 | PZM141 | PZM013 | PZM056 | PZM010 | PZM012 | PZM013 | PZM056 | Shallow | Shallow | |
| | Shallow Summer 2004 | Lower Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | Lower Summer 2004 | Summer 2004 | Summer 2004 | |
| Antimony | 4.2 U | 4.1 U | 2.9 U | 2.6 U | 3.3 U | 2.4 U | 2.3 U | 2.1 | 2.3 | 2.1 | 2.3 | 2.3 | 2.3 | 2.1 | 2 U | |
| Arsenic | 5 U | 10 | 7.9 | 5 U | 5 U | 7.1 | 5 U | 5 U | 9 | 5 U | 5 U | 9 | 9 | 5 U | 5 U | |
| Barium | 280 | 210 | 280 | 130 | 67 | 400 | 150 | 65 | 210 | 65 | 150 | 210 | 210 | 65 | 30 | |
| Beryllium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.9 L | |
| Chromium | 9.5 U | 7.4 U | 6.2 U | 8.4 U | 13 U | 5.2 U | 5.6 U | 8.6 U | 34 U | 8.6 U | 5.6 U | 34 U | 34 U | 8.6 U | 7.6 U | |
| Cobalt | 1 J | 1 | 1.1 | 0.7 J | 0.8 J | 0.9 J | 1 U | 0.8 J | 1.9 | 0.8 J | 1 U | 1.9 | 1.9 | 0.8 J | 37 | |
| Copper | 5.1 | 11 | 7.4 | 2 U | 3 | 7.5 | 2.8 | 2.3 | 14 | 2.3 | 2.8 | 14 | 14 | 2.3 | 2 U | |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Lead | 1 U | 1 U | 1 U | 1 U | 0.7 J | 0.5 J | 1 U | 1 | 50 | 1 | 1 U | 50 | 50 | 1 | 1 U | |
| Nickel | 14 | 17 | 9.9 | 11 | 9.2 | 7.5 | 2.9 | 13 | 14 | 13 | 2.9 | 14 | 14 | 13 | 58 | |
| Selenium | 5 U | 30 | 20 | 3 J | 4 J | 21 | 6.4 | 5 J | 22 | 5 J | 6.4 | 22 | 22 | 5 J | 5 U | |
| Thallium | 0.6 J | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Tin | 1300 J | 1200 | 520 | 800 | 700 | 180 | 90 | 740 | 1100 | 740 | 90 | 1100 | 1100 | 740 | 35 J | |
| Vanadium | 14 | 5 U | 5 U | 18 | 220 | 5 U | 5 U | 5 U | 69 | 5 U | 5 U | 69 | 69 | 5 U | 5 U | |
| Zinc | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 44 | 10 U | 10 U | 44 | 44 | 10 U | 100 K | |
| Antimony, dissolved | 3.6 U | 3.9 U | 2.7 U | 2.8 U | 2.7 U | 2.1 U | 4.3 U | 2 U | 2 U | 2.1 U | 4.3 U | 2 U | 2 U | 2 U | 2 U | |
| Arsenic, dissolved | 5 U | 9.8 | 6.6 | 5 U | 5 U | 7.4 | 5 U | 5 U | 9.3 | 5 U | 5 U | 9.3 | 9.3 | 5 U | 5 U | |
| Barium, dissolved | 280 | 200 | 260 | 120 | 64 | 390 | 50 | 51 | 180 | 51 | 50 | 180 | 180 | 51 | 30 | |
| Beryllium, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1.1 | 1 U | 1 U | 1 U | 1.1 | 1 U | 1 U | 1 U | 0.8 L | |
| Cadmium, dissolved | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.3 J | 0.5 U | 0.5 U | 0.5 U | 0.3 J | 0.5 U | 0.5 U | 0.5 U | 1.8 U | |
| Cobalt, dissolved | 1 | 1 J | 0.8 J | 1.2 | 0.7 J | 1 U | 36 | 0.7 J | 1 J | 1 U | 36 | 1 J | 1 J | 0.7 J | 34 | |
| Copper, dissolved | 2 U | 10 | 7.7 | 2 U | 2.8 | 7.1 | 2.7 | 2 U | 6.1 | 2 U | 2.7 | 6.1 | 6.1 | 2 U | 2 K | |
| Iron, dissolved | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Lead, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Nickel, dissolved | 15 | 17 | 10 | 10 | 8.1 | 6.7 | 47 | 9.9 | 12 | 9.9 | 47 | 12 | 12 | 9.9 | 54 | |
| Selenium, dissolved | 3 J | 32 | 22 | 5 U | 4 J | 22 | 3 J | 5 U | 24 | 5 U | 3 J | 24 | 24 | 5 U | 5 U | |
| Tin, dissolved | 1500 | 1200 | 540 | 710 | 690 | 190 | 100 | 770 | 1000 | 770 | 100 | 1000 | 1000 | 770 | 39 J | |
| Vanadium, dissolved | 13 | 5 U | 5 U | 19 | 210 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5.8 U | |
| Zinc, dissolved | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 150 | 10 U | 10 U | 10 U | 150 | 10 U | 10 U | 10 U | 94 K | |
| Alkalinity, total | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Cyanide, available | 2 U | 2 U | 2 U | 2 U | 2 U | 2.3 U | 2 U | 2 U | 2 U | 2.3 U | 2 U | 2 U | 2 U | 2 U | 2 U | |
| Cyanide, total | 50 | 10 | 11 | 140 | 95 | 5.1 U | 8.7 | 670 | 15 | 5.1 U | 8.7 | 15 | 15 | 670 | 1.6 | |
| Methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Nitrate, as N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Nitrite, as N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Sulfate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Sulfide | 1400 L | 1200 L | 1000 UL | 1700 L | 1100 L | 1000 UL | 1800 L | 5200 L | 1400 L | 1000 UL | 1800 L | 1400 L | 1400 L | 5200 L | 1000 UL | |

**Table 4-9
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.**

| Analyte, ug/L | SW13 | | SW14 | | SW17 | |
|----------------------|------------------------|-----------------------------|------------------------|----------------------|------------------------|-----------------------------|
| | PZM003 | PZM025 | PZM004 (duplicates) | PZM099 | PZM007 | PZM038 |
| | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 |
| Antimony | 2 U | 3.1 U | 2.9 U | 2 U | 2 U | 2 U |
| Arsenic | 5 J | 8.5 | 5 U | 5 U | 3 J | 180 |
| Barium | 80 | 110 | 51 | 150 J | 110 | 110 |
| Beryllium | 1 U | 1 U | 0.7 U | 1 U | 1 U | 1 U |
| Chromium | 23 U | 5.4 U | 6.3 U | 7.9 U | 11 U | 10 U |
| Cobalt | 1 U | 5.7 | 30 | 0.6 J | 0.7 J | 0.8 J |
| Copper | 6.8 | 4.2 J | 2.6 | 2 U | 3.4 | 7.3 |
| Iron | 2200 | 45000 | 4000 | 26000 | 100 U | 3200 |
| Lead | 7.2 U | 1 UJ | 1 U | 1 J | 1 U | 1 U |
| Nickel | 3.2 U | 12 U | 40 | 2.8 U | 14 U | 8 U |
| Selenium | 5 U | 9 | 5 U | 5 U | 4 J | 16 |
| Thallium | 1 U | 1 U | 1 U | 0.7 J | 1 U | 1 U |
| Tin | 220 | 530 | 210 | 140 K | 600 | 150 |
| Vanadium | 30 | 5 U | 5 U | 5 U | 19 | 5 U |
| Zinc | 50 | 10 UJ | 130 | 10 U | 10 U | 10 U |
| Antimony, dissolved | 2 U | 2.7 U | 2 U | 2.9 U | 2 U | 2 U |
| Arsenic, dissolved | 5 U | 10 | 5 U | 5 U | 5 U | 180 |
| Barium, dissolved | 60 | 100 | 51 | 140 J | 110 | 110 |
| Beryllium, dissolved | 1 U | 1 U | 0.9 J | 1 U | 1 U | 1 U |
| Cadmium, dissolved | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cobalt, dissolved | 1 U | 5.6 | 30 | 1 U | 0.7 J | 0.7 J |
| Copper, dissolved | 2 J | 3.5 | 3.1 | 2 U | 3.5 | 8 |
| Iron, dissolved | -- | -- | -- | -- | -- | -- |
| Lead, dissolved | 1.1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Nickel, dissolved | 2.2 U | 11 U | 40 | 2 U | 1.5 U | 7.9 U |
| Selenium, dissolved | 5 U | 8.3 | 5 U | 5 U | 5 U | 18 |
| Tin, dissolved | 170 | 560 | 230 | 140 K | 610 | 150 |
| Vanadium, dissolved | 20 | 5 U | 5 U | 5 U | 20 | 5 U |
| Zinc, dissolved | 10 | 10 U | 140 | 5 J | 10 U | 10 U |
| Alkalinity, total | 12000 | 16000 | -- | -- | 52000 | 42000 |
| Chloride | 20000 | 98000 | -- | -- | 66000 | 300000 |
| Cyanide, available | 2 U | 2 UL | 2 U | 2 U | 2 UL | 12 L |
| Cyanide, total | 120 | 4.1 | 30 | 1 U | 99 | 1000 |
| Methane | 3.9 U | -- | -- | -- | -- | -- |
| Nitrate, as N | 1000 | 50 U | -- | -- | 50 U | 50 U |
| Nitrite, as N | 20 | 5 U | -- | -- | 5 U | 5 U |
| Sulfate | 99000 | 94000 | -- | -- | 120000 | 35000 |
| Sulfide | 1000 UJ | 1000 UL | 1000 UJ | 1000 UL | 4400 L | 1000 L |
| | | | | | | 1000 UL |



Table 4-9
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Oven Area SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | SW18 | | TS05 |
|----------------------|---------------------|-------------|-------------|
| | PZM008 (duplicates) | | |
| | PZM114 | PPM007 | |
| | Shallow | Lower | Shallow |
| | Summer 2004 | Summer 2004 | Summer 2004 |
| Antimony | 2 U | 2 U | 5.1 U |
| Arsenic | 5 U | 3 J | 5 U |
| Barium | 70 | 310 | 99 |
| Beryllium | 1 U | 1 U | 1 U |
| Chromium | 7.8 U | 9.6 U | 5.7 U |
| Cobalt | 1 J | 1.6 U | 1 U |
| Copper | 2 U | 2 U | 2 U |
| Iron | 100 U | 100 U | -- |
| Lead | 0.8 J | 0.8 J | 1 U |
| Nickel | 14 | 23 | 8.3 U |
| Selenium | 5 U | 6.3 | 5 U |
| Thallium | 1 U | 1 U | 0.7 J |
| Tin | 740 | 1100 | 380 |
| Vanadium | 110 | 5 U | 5.2 |
| Zinc | 10 U | 10 U | 10 U |
| Antimony, dissolved | 2 U | 3.5 U | 6.9 U |
| Arsenic, dissolved | 5 U | 3 J | 5 U |
| Barium, dissolved | 68 | 320 | 100 |
| Beryllium, dissolved | 1 U | 1 U | 1 U |
| Cadmium, dissolved | 1 U | 1 U | 1 U |
| Cobalt, dissolved | 0.9 J | 0.9 J | 1 U |
| Copper, dissolved | 2 U | 2 U | 2 U |
| Iron, dissolved | -- | -- | -- |
| Lead, dissolved | 0.7 J | 1 U | 1 U |
| Nickel, dissolved | 14 | 23 | 7.7 U |
| Selenium, dissolved | 5 U | 6.6 | 5 U |
| Tin, dissolved | 700 | 1100 | 410 |
| Vanadium, dissolved | 110 | 5 U | 3 J |
| Zinc, dissolved | 10 U | 10 U | 10 U |
| Alkalinity, total | -- | -- | -- |
| Chloride | -- | -- | -- |
| Cyanide, available | 2 U | 2 UL | 2.2 |
| Cyanide, total | 280 | 590 | 11 |
| Methane | -- | -- | -- |
| Nitrate, as N | -- | -- | -- |
| Nitrite, as N | -- | -- | -- |
| Sulfate | -- | -- | -- |
| Sulfide | 2100 L | 3500 L | 1400 L |

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

R Unreliable result. Analyte may or may not be present in the sample.

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ Not detected, quantitation limit may be inaccurate or imprecise.

UL Not detected, quantitation limit is probably higher.

D Result reported from a secondary dilution.

-- Not analyzed.



Table 4-10
 Detected VOCs in Groundwater
 Nature & Extent Investigation
 Coke Point Landfill SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | CP05 | | | CP08 | | | CP09 | | | CP11 | | | CP14 | | |
|----------------------|-----------------------------|----------------------|------------------------|-----------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|----------------------|--|
| | PZM028 | PZM128 | PZM008 | PZM034 | PZM010 | PZM047 | PZM010 | PZM010 | PZM010 | PZM010 | PZM010 | PZM040 | PZM009 | PZM062 | |
| | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | |
| 2-Hexanone | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | |
| 4-Methyl-2-pentanone | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | |
| Acetone | 31 U | 18 U | 250 U | 4 J | 230 | 5.4 U | 160 | 160 | 160 | 14 U | 23 U | 23 U | 6100 D | 6100 D | |
| Benzene | 150 | 1 U | 12000 D | 1 U | 4 | 1 J | 31 | 31 | 31 | 1.1 | 6.4 | 6.4 | 1 U | 1 U | |
| Bromoform | 2.6 | 1 U | 50 U | 1 U | 2.8 | 1 U | 3.3 | 3.3 | 3.3 | 1 U | 3.1 | 3.1 | 1 U | 1 U | |
| Carbon disulfide | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Ethylbenzene | 2.7 | 1 U | 58 | 1 U | 1 U | 1 U | 0.6 J | 0.6 J | 0.6 J | 1 U | 1 U | 1 U | 1 U | 1 U | |
| Methylene chloride | 1.9 U | 2.9 U | 150 U | 2 U | 2 U | 1.8 U | 3.6 U | 3.6 U | 3.6 U | 4.2 U | 1.7 U | 1.7 U | 2.1 U | 2.1 U | |
| Toluene | 50 | 0.7 J | 3700 | 1 U | 1.8 | 0.5 J | 4.6 | 4.6 | 4.6 | 1 U | 1.1 | 1.1 | 0.8 J | 0.8 J | |
| Xylene, total | 28 | 1 U | 2300 | 0.6 J | 1.5 | 1 U | 5.5 | 5.5 | 5.5 | 2 U | 1.4 | 1.4 | 1 U | 1 U | |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-10

Detected VOCs in Groundwater
 Nature & Extent Investigation
 Coke Point Landfill SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | CP15 | | | CP16 | | | CP17 | | | | |
|----------------------|---------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|--------------|--------|
| | PZM020 | | PZM042 | | PZM018 | | PZM035 | | PZM013 | | PZM058 |
| | Shallow | Intermediate | Lower |
| 2-Hexanone | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 3 J |
| 4-Methyl-2-pentanone | 4 J | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Acetone | 260 | 6.4 U | 29 | 51 | 12 U | 7400 D | 7.5 | 0.6 J | 1 U | 1 U | 1 U |
| Benzene | 15 | 1.0 U | 100 | 260 | 2.8 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromoform | 3.7 | 1 U | 2.8 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon disulfide | 1.6 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Ethylbenzene | 0.8 J | 1.0 U | 0.5 J | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| Methylene chloride | 3.6 U | 2.1 | 2.9 U | 2.7 U | 4.6 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 |
| Toluene | 3.1 | 1.0 U | 0.8 J | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| Xylenes, total | 3.4 | 2.0 U | 1 U | 4.5 | 7.7 | 1.6 | 7.9 | 2 U | 2 U | 2 U | 2 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-11

Detected SVOCs in Groundwater
Nature & Extent Investigation
Coke Point Landfill SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CP05 | | | CP08 | | | CP09 | | | CP11 | | | CP14 | |
|----------------------------|-----------------------------|----------------------|------------------------|-----------------------------|------------------------|-----------------------------|------------------------|-----------------------------|------------------------|-----------------------------|------------------------|----------------------|-------|-------------|
| | PZM023 | PZM128 | PZM008 | PZM034 | PZM010 | PZM047 | PZM010 | PZM040 | PZM010 | PZM040 | PZM1009 | PZM062 | Lower | Summer 2004 |
| | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | | |
| 2,4-Dimethylphenol | 24 | 10 U | 31 | 10 U | 10 U | 10 U | 10 U | 10 U | 27 | 10 U | 10 U | 10 U | 10 U | 10 U |
| 2-Methylnaphthalene | 63 | 10 U | 24 | 10 U | 8.4 J | 10 U | 10 U | 10 U | 13 | 10 U | 10 U | 10 U | 10 U | 10 U |
| 2-Methylphenol | 5.5 J | 10 U | 20 | 10 U | 10 | 10 U | 10 U | 10 U | 17 | 10 U | 10 U | 10 U | 10 U | 10 U |
| 3- & 4-Methylphenol | 50 | 5.7 J | 21 | 10 U | 55 | 10 U | 10 U | 10 U | 46 | 10 U | 10 U | 10 U | 10 U | 10 U |
| Acenaphthene | 58 | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Acenaphthylene | 13 | 10 U | 5.6 J | 10 U | 10 U | 10 U | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Dibenzofuran | 22 | 10 U | 9.9 J | 10 U | 10 U | 10 U | 10 U | 23 |
| Fluoranthene | 10 U | 10 U | 5.5 J | 10 U | 10 U | 10 U | 10 U | 10 U |
| Fluorene | 24 | 10 U | 11 | 10 U | 10 U | 10 U | 10 U | 10 U |
| Naphthalene | 1300 D | 10 U | 450 D | 10 U | 99 | 20 | 10 U | 10 U | 95 | 10 U | 10 U | 10 U | 10 U | 10 U |
| Phenanthrene | 11 | 10 U | 21 | 10 U | 6 J | 23 | 10 U | 10 U | 10 | 10 U | 10 U | 10 U | 10 U | 10 U |
| Phenol | 260 D | 10 U | 9.8 J | 10 U | 110 | 10 U | 10 U | 10 U | 73 | 6.1 J | 10 U | 10 U | 10 U | 10 U |
| Pyridine | 20 U | 20 U | 110 | 20 U | 20 U | 20 U | 20 U | 20 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.



Table 4-11

Detected SVOCs in Groundwater
Nature & Extent Investigation
Coke Point Landfill SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CP15 | | | CP16 | | | CP17 | |
|----------------------------|-------------|--------------|-------------|-------------|--------------|-------------|-------------|-------------|
| | PZM020 | PZM042 | | PZM018 | PZM035 | | PZM013 | PZM058 |
| | Shallow | Intermediate | | Shallow | Intermediate | | Shallow | Lower |
| | Summer 2004 | Fall 2002 | Summer 2004 | Summer 2004 | Fall 2002 | Summer 2004 | Summer 2004 | Summer 2004 |
| 2,4-Dimethylphenol | 42 | -- | 10 U | 10 U | -- | 26 | 16 | 10 U |
| 2-Methylnaphthalene | 17 | -- | 10 U | 10 U | -- | 10 U | 7.3 J | 10 U |
| 2-Methylphenol | 41 | -- | 10 U | 10 U | -- | 29 | 20 | 10 U |
| 3- & 4-Methylphenol | 100 | -- | 10 U | 5.5 J | -- | 42 | 54 | 10 U |
| Acenaphthene | 10 U | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| Acenaphthylene | 10 U | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| bis(2-Ethylhexyl)phthalate | 10 U | -- | 32 | 10 U | -- | 210 D | 10 U | 10 U |
| Dibenzofuran | 10 U | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| Fluoranthene | 10 U | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| Fluorene | 5.7 J | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| Naphthalene | 140 | 1.0 U | 10 U | 28 | 180 | 58 | 140 | 10 U |
| Phenanthrene | 12 | -- | 10 U | 10 U | -- | 10 U | 10 U | 10 U |
| Phenol | 370 D | -- | 10 U | 13 | -- | 150 | 49 | 31 |
| Pyridine | 20 U | -- | 20 U | 20 U | -- | 15 J | 20 U | 20 U |

- U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.
- R Unreliable result. Analyte may or may not be present in the sample.
- J Analyte present. Reported value may not be accurate or precise.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- UJ Not detected, quantitation limit may be inaccurate or imprecise.
- UL Not detected, quantitation limit is probably higher.
- D Result reported from a secondary dilution.
- Not analyzed.

Table 4-12
 Detected Metals and Miscellaneous Analytes in Groundwater
 Nature & Extent Investigation
 Coke Point Landfill SSA
 ISG Sparrows Point, Inc.

| Analyte, ug/L | CP03 | | | CP05 | | | CP06 | | | CP08 | | | CP09 | | |
|---------------------|------------------------|-----------------------------|-----------------------------|----------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|-----------------------------|
| | PZM008 | PZM025 | PZM028 | PZM128 | PZM009 | PZM008 | PZM034 | PZM010 | PZM008 | PZM009 | PZM034 | PZM010 | PZM008 | PZM009 | PZM034 |
| | Shallow Summer 2004 | Intermediate Summer 2004 | Intermediate Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 |
| Antimony | 2.2 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Arsenic | 14 | 13 | 7.8 | 5 U | 25 | 5 U | 10 | 5.6 | 25 | 10 | 5.6 | 5.6 | 25 | 10 | 29 |
| Barium | 57 | 130 | 580 | 200 | 280 | 200 | 57 | 400 | 280 | 57 | 400 | 400 | 280 | 57 | 210 |
| Cadmium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chromium | 5.8 | 6.4 | 12 U | 21 U | 7.6 | 14 U | 11 U | 30 J | 7.6 | 11 U | 11 U | 30 J | 7.6 | 11 U | 10 U |
| Cobalt | 1 J | 5.8 | 2.2 | 2.9 | 1 J | 1.3 | 1.2 | 2.2 | 1 J | 1.2 | 2.2 | 2.2 | 1 J | 1.2 | 2.7 |
| Copper | 2.4 | 6.5 | 9.3 | 13 | 5.6 | 2 U | 11 | 8.7 | 5.6 | 11 | 8.7 | 8.7 | 5.6 | 11 | 18 |
| Iron | -- | -- | 2200 | 81000' | -- | 100 U | 3500 | 100 U | -- | 3500 | 100 U | 100 U | 100 U | 3500 | 16000 |
| Lead | 1.1 | 1 U | 1.6 | 1.9 | 1 U | 1 U | 1 U | 24 | 1 U | 1 U | 24 | 24 | 1 U | 1 U | 0.8 J |
| Mercury | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 14 | 13 | 50 | 7.8 | 31 | 20 | 12 | 48 | 31 | 12 | 48 | 48 | 31 | 12 | 13 |
| Selenium | 4 J | 34 | 29 | 4 J | 21 | 5 U | 41 | 15 | 21 | 41 | 15 | 15 | 21 | 41 | 93 |
| Thallium | 1 J | 1 U | 1 U | 1 U | 1 U | 1 U | 5 | 0.6 J | 1 U | 5 | 0.6 J | 0.6 J | 1 U | 5 | 4.2 |
| Tin | 430 | 820 | 2300 J | 59 J | 820 | 1300 | 390 | 2300 J | 820 | 390 | 2300 J | 2300 J | 820 | 390 | 310 J |
| Vanadium | 19 | 4 J | 5 U | 40 | 7.9 | 26 | 5 U | 5 U | 7.9 | 5 U | 5 U | 5 U | 7.9 | 5 U | 7.9 |
| Zinc | 10 U | 16 U | 10 U | 15 | 15 U | 10 U | 10 U | 10 U | 15 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Antimony, dissolved | 2 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2.7 U |
| Arsenic, dissolved | 13 | 13 | 6.4 | 5 U | 25 | 5 U | 14 | 5 J | 25 | 14 | 5 J | 5 J | 25 | 14 | 23 |
| Barium, dissolved | 57 | 120 | 580 | 200 | 280 | 200 | 52 | 390 | 280 | 52 | 390 | 390 | 280 | 52 | 200 |
| Chromium, dissolved | 5.8 | 5.7 | 6.4 U | 4.1 U | 5.5 | 15 U | 9.5 U | 35 K | 5.5 | 9.5 U | 35 K | 35 K | 5.5 | 9.5 U | 8.2 U |
| Cobalt, dissolved | 0.9 J | 5.8 | 2 | 0.9 J | 0.9 J | 1.5 | 1 | 2.2 | 0.9 J | 1 | 2.2 | 2.2 | 0.9 J | 1 | 2.4 |
| Copper, dissolved | 2.4 | 5.9 | 7.7 | 2.8 | 5.1 | 2 U | 11 | 7.6 | 5.1 | 11 | 7.6 | 7.6 | 5.1 | 11 | 17 |
| Lead, dissolved | 1 U | 1 U | 1 U | 0.6 J | 1.1 | 1 U | 1 U | 6.9 | 1.1 | 1 U | 6.9 | 6.9 | 1.1 | 1 U | 0.7 J |
| Nickel, dissolved | 13 | 13 | 51 | 3.3 | 30 | 20 | 10 | 48 | 30 | 10 | 48 | 48 | 30 | 10 | 13 |
| Selenium, dissolved | 4 J | 37 | 28 | 3 J | 20 | 5 U | 44 | 17 | 20 | 44 | 17 | 17 | 20 | 44 | 80 |
| Thallium, dissolved | 0.5 J | 1 U | 1 U | 1 U | 1 U | 1 U | 3.5 | 1 U | 1 U | 3.5 | 1 U | 1 U | 1 U | 3.5 | 0.7 J |
| Tin, dissolved | 410 | 900 | 2400 J | 61 J | 830 | 1400 | 370 | 2400 J | 830 | 370 | 2400 J | 2400 J | 830 | 370 | 340 J |
| Vanadium, dissolved | 13 U | 5 U | 5 U | 5 U | 5 U | 28 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 7.6 |
| Zinc, dissolved | 35 | 10 U | 10 U | 20 | 14 U | 10 U | 21 | 6 J | 14 U | 21 | 6 J | 6 J | 14 U | 21 | 10 U |
| Alkalinity, total | -- | -- | -- | -- | -- | 390000 | 1400000 | -- | -- | 390000 | 1400000 | -- | -- | -- | -- |
| Chloride | -- | -- | -- | -- | -- | 97000 | 3700000 | -- | -- | 97000 | 3700000 | -- | -- | -- | -- |
| Cyanide, total | -- | -- | 110 | 1 J | -- | 120 | 1.6 | 100 | -- | 120 | 1.6 | 100 | -- | 120 | 2.2 |
| Methane | -- | -- | -- | -- | -- | 2200 L | 39000 K | -- | -- | 2200 L | 39000 K | -- | -- | 2200 L | -- |
| Nitrate, as N | -- | -- | -- | -- | -- | 50 U | 50 U | -- | -- | 50 U | 50 U | -- | -- | 50 U | -- |
| Nitrite, as N | -- | -- | -- | -- | -- | 22 | 5 U | -- | -- | 22 | 5 U | -- | -- | 22 | -- |
| Sulfate | -- | -- | -- | -- | -- | 660000 | 40000 | -- | -- | 660000 | 40000 | -- | -- | 660000 | -- |
| Sulfide | -- | -- | 18000 L | 1000 UL | -- | 1000 UL | 800 J | 5600 L | -- | 1000 UL | 800 J | 5600 L | -- | 1000 UL | 4800 L |



Table 4-12
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Point Landfill SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CP10 | | CP11 | | | CP14 | | CP15 | | CP16 | |
|---------------------|------------------------|------------------------|-----------------------------|------------------------|----------------------|------------------------|-----------------------------|------------------------|-----------------------------|------------------------|-----------------------------|
| | PZM008 | PZM010 | PZM040 | PZM009 | PZM062 | PZM020 | PZM042 | PZM018 | PZM035 | | |
| | Shallow Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Lower Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 | Shallow Summer 2004 | Intermediate Summer 2004 |
| Antimony | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 3.1 U | 2 U | 3.1 U | 2 U | 2 U |
| Arsenic | 4 J | 5 U | 19 | 5 U | 11 | 4 J | 24 | 5 U | 5 U | 5 U | 5 U |
| Barium | 1900 | 1300 J | 130 J | 240 | 70 | 1500 J | 240 | 160 | 690 | 160 | 690 |
| Cadmium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chromium | 7.9 U | 13 U | 7.3 U | 13 U | 9.1 U | 32 U | 7.5 U | 13 U | 14 U | 13 U | 14 U |
| Cobalt | 2.1 | 2.8 | 1.3 | 3.1 | 0.7 J | 2.5 | 0.9 J | 3.1 | 3.1 | 3.1 | 3.1 |
| Copper | 2 | 2.5 | 14 | 2 U | 4.6 | 4.3 | 18 | 2 U | 2 U | 2 U | 2 U |
| Iron | -- | 190 | 260 | 880 | 390 | 550 | 1500 | 100 U | 100 U | 100 U | 100 U |
| Lead | 0.6 J | 1.3 | 1 U | 1 U | 1 U | 2.1 | 1 U | 1 U | 1 U | 1 U | 1 U |
| Mercury | 0.1 J | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 42 | 49 | 18 | 44 | 11 | 47 | 12 | 51 | 69 | 51 | 69 |
| Selenium | 5.9 | 4 J | 68 | 4 J | 20 | 5.7 | 76 | 3 J | 3 J | 3 J | 3 J |
| Thallium | 7.4 | 1 U | 1 U | 1 U | 1 U | 1 U | 4.6 | 1 U | 1 U | 1 U | 1 U |
| Tin | 2700 | 3000 K | 530 K | 3400 J | 650 | 2700 K | 200 J | 3400 | 3400 | 3400 | 3400 |
| Vanadium | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Zinc | 13 | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Antimony, dissolved | 2 U | 2 U | 2 U | 2 U | 2.4 U | 2.9 U | 2.4 U | 2 U | 2 U | 2 U | 2 U |
| Arsenic, dissolved | 4 J | 5 U | 23 | 5 U | 8.7 | 5 U | 22 | 5 U | 5 U | 5 U | 5 U |
| Barium, dissolved | 1900 | 1300 J | 120 J | 240 | 68 | 1600 J | 210 | 170 | 680 | 170 | 680 |
| Chromium, dissolved | 8.7 U | 13 U | 6.6 U | 13 U | 6.3 U | 32 U | 7.8 U | 14 U | 14 U | 14 U | 14 U |
| Cobalt, dissolved | 2.1 | 3 | 1.2 | 3 | 0.7 J | 2.5 | 0.9 J | 3.3 | 3.2 | 3.3 | 3.2 |
| Copper, dissolved | 2 J | 2.6 | 13 | 2 U | 4.9 | 6 | 15 | 2 U | 2 U | 2 U | 2 U |
| Lead, dissolved | 1 U | 0.5 J | 1 U | 1 U | 1 U | 0.7 J | 1 U | 1 U | 1 U | 1 U | 1 U |
| Nickel, dissolved | 46 | 52 | 16 | 40 | 11 | 52 | 11 | 54 | 71 | 54 | 71 |
| Selenium, dissolved | 5.9 | 4 J | 78 | 5 U | 10 | 6.1 | 74 | 5 U | 3 J | 5 U | 3 J |
| Thallium, dissolved | 2.5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1.5 | 1 U | 1 U | 1 U | 1 U |
| Tin, dissolved | 2700 | 2900 K | 440 K | 3600 J | 610 | 2600 K | 220 J | 3500 | 3400 | 3500 | 3400 |
| Vanadium, dissolved | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Zinc, dissolved | 10 | 10 U | 10 U | 10 U | 10 U | 10 U | 8 J | 10 U | 10 U | 10 U | 10 U |
| Alkalinity, total | -- | 250000 J | 400000 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Chloride | -- | 630000 | 630000 | -- | -- | -- | -- | -- | -- | -- | -- |
| Cyanide, total | -- | 180 | 1.9 | 530 | 14 | 230 | 1 J | 450 | 170 | 450 | 170 |
| Methane | -- | 2300 | 49000 | -- | -- | -- | -- | -- | -- | -- | -- |
| Nitrate, as N | -- | 50 | 50 U | -- | -- | -- | -- | -- | -- | -- | -- |
| Nitrite, as N | -- | 1500 | 5 U | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfate | -- | 9800 | 3500 | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfide | -- | 1000 UL | 1900 L | 2700 L | 2100 L | 1000 U | 900 L | 16000 L | 1800 L | 16000 L | 1800 L |

Table 4-12
Detected Metals and Miscellaneous Analytes in Groundwater
Nature & Extent Investigation
Coke Point Landfill SSA
ISG Sparrows Point, Inc.

| Analyte, ug/L | CPI17 | |
|---------------------|-------------|-------------|
| | PZM013 | PZM058 |
| | Shallow | Lower |
| | Summer 2004 | Summer 2004 |
| Antimony | 3.1 U | 3.3 U |
| Arsenic | 5 U | 5.8 |
| Barium | 170 J | 160 J |
| Cadmium | 0.8 J | 1 U |
| Chromium | 9.9 U | 8.1 U |
| Cobalt | 1.3 | 1.3 |
| Copper | 4.4 | 12 |
| Iron | 100 U | 380 |
| Lead | 34 | 4.6 |
| Mercury | 0.2 U | 0.2 U |
| Nickel | 25 | 22 |
| Selenium | 5 U | 23 |
| Thallium | 1 U | 1 U |
| Tin | 1700 K | 1600 K |
| Vanadium | 5 U | 5 U |
| Zinc | 10 U | 10 U |
| Antimony, dissolved | 2 U | 2.5 U |
| Arsenic, dissolved | 5 U | 10 |
| Barium, dissolved | 180 J | 200 J |
| Chromium, dissolved | 12 U | 8.8 U |
| Cobalt, dissolved | 1.3 | 1.5 |
| Copper, dissolved | 2 U | 6.3 |
| Lead, dissolved | 1 U | 1 U |
| Nickel, dissolved | 27 | 26 |
| Selenium, dissolved | 5 U | 28 |
| Thallium, dissolved | 1 U | 1 U |
| Tin, dissolved | 1600 K | 1800 K |
| Vanadium, dissolved | 5 U | 5 U |
| Zinc, dissolved | 10 U | 10 U |
| Alkalinity, total | 1800000 J | 3000000 J |
| Chloride | 190000 | 3000000 |
| Cyanide, total | 850 | 37 |
| Methane | 1800 J | 990 J |
| Nitrate, as N | 50 | 50 U |
| Nitrite, as N | 300 | 3 J |
| Sulfate | 54000 | 1000 U |
| Sulfide | 900 L | 800 L |

U The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

R Unreliable result. Analyte may or may not be present in the sample.

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

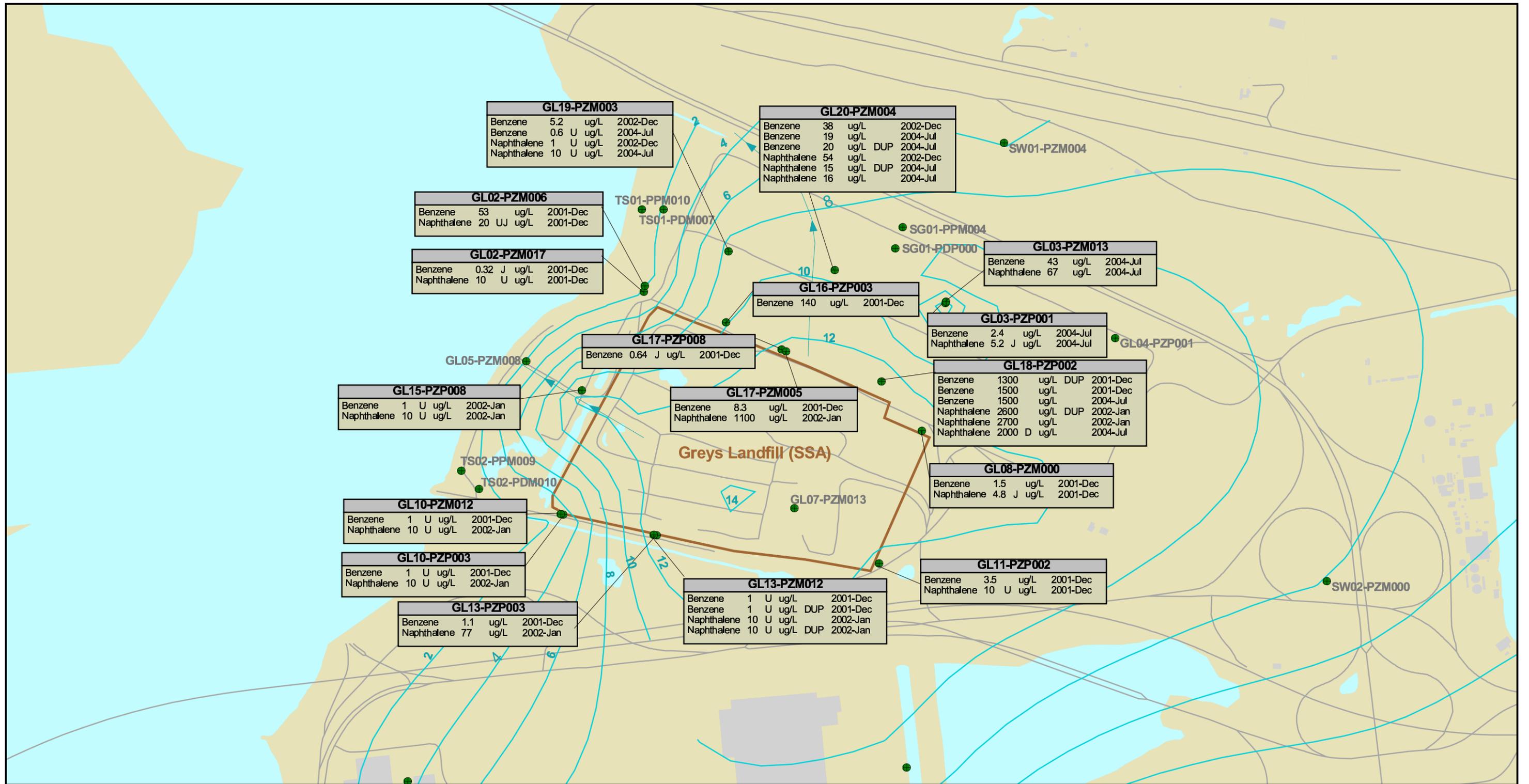
UJ Not detected, quantitation limit may be inaccurate or imprecise.

UL Not detected, quantitation limit is probably higher.

D Result reported from a secondary dilution.

- Not analyzed.

**SECTION FOUR
FIGURES**



| GL19-PZM003 | | | |
|-------------|-----|--------|----------|
| Benzene | 5.2 | ug/L | 2002-Dec |
| Benzene | 0.6 | U ug/L | 2004-Jul |
| Naphthalene | 1 | U ug/L | 2002-Dec |
| Naphthalene | 10 | U ug/L | 2004-Jul |

| GL20-PZM004 | | | |
|-------------|----|----------|----------|
| Benzene | 38 | ug/L | 2002-Dec |
| Benzene | 19 | ug/L | 2004-Jul |
| Benzene | 20 | ug/L DUP | 2004-Jul |
| Naphthalene | 54 | ug/L | 2002-Dec |
| Naphthalene | 15 | ug/L DUP | 2004-Jul |
| Naphthalene | 16 | ug/L | 2004-Jul |

| GL02-PZM006 | | | |
|-------------|----|---------|----------|
| Benzene | 53 | ug/L | 2001-Dec |
| Naphthalene | 20 | UJ ug/L | 2001-Dec |

| GL02-PZM017 | | | |
|-------------|------|--------|----------|
| Benzene | 0.32 | J ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2001-Dec |

| GL03-PZM013 | | | |
|-------------|----|------|----------|
| Benzene | 43 | ug/L | 2004-Jul |
| Naphthalene | 67 | ug/L | 2004-Jul |

| GL16-PZP003 | | | |
|-------------|-----|------|----------|
| Benzene | 140 | ug/L | 2001-Dec |

| GL03-PZP001 | | | |
|-------------|-----|--------|----------|
| Benzene | 2.4 | ug/L | 2004-Jul |
| Naphthalene | 5.2 | J ug/L | 2004-Jul |

| GL17-PZP008 | | | |
|-------------|------|--------|----------|
| Benzene | 0.64 | J ug/L | 2001-Dec |

| GL18-PZP002 | | | |
|-------------|------|----------|----------|
| Benzene | 1300 | ug/L DUP | 2001-Dec |
| Benzene | 1500 | ug/L | 2001-Dec |
| Benzene | 1500 | ug/L | 2004-Jul |
| Naphthalene | 2600 | ug/L DUP | 2002-Jan |
| Naphthalene | 2700 | ug/L | 2002-Jan |
| Naphthalene | 2000 | D ug/L | 2004-Jul |

| GL15-PZP008 | | | |
|-------------|----|--------|----------|
| Benzene | 1 | U ug/L | 2002-Jan |
| Naphthalene | 10 | U ug/L | 2002-Jan |

| GL17-PZM005 | | | |
|-------------|------|------|----------|
| Benzene | 8.3 | ug/L | 2001-Dec |
| Naphthalene | 1100 | ug/L | 2002-Jan |

| GL08-PZM000 | | | |
|-------------|-----|--------|----------|
| Benzene | 1.5 | ug/L | 2001-Dec |
| Naphthalene | 4.8 | J ug/L | 2001-Dec |

| GL10-PZM012 | | | |
|-------------|----|--------|----------|
| Benzene | 1 | U ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2002-Jan |

| GL10-PZP003 | | | |
|-------------|----|--------|----------|
| Benzene | 1 | U ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2002-Jan |

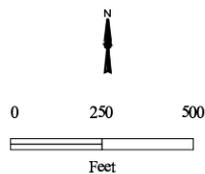
| GL13-PZP003 | | | |
|-------------|-----|------|----------|
| Benzene | 1.1 | ug/L | 2001-Dec |
| Naphthalene | 77 | ug/L | 2002-Jan |

| GL13-PZM012 | | | |
|-------------|----|------------|----------|
| Benzene | 1 | U ug/L | 2001-Dec |
| Benzene | 1 | U ug/L DUP | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2002-Jan |
| Naphthalene | 10 | U ug/L DUP | 2002-Jan |

| GL11-PZP002 | | | |
|-------------|-----|--------|----------|
| Benzene | 3.5 | ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2001-Dec |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



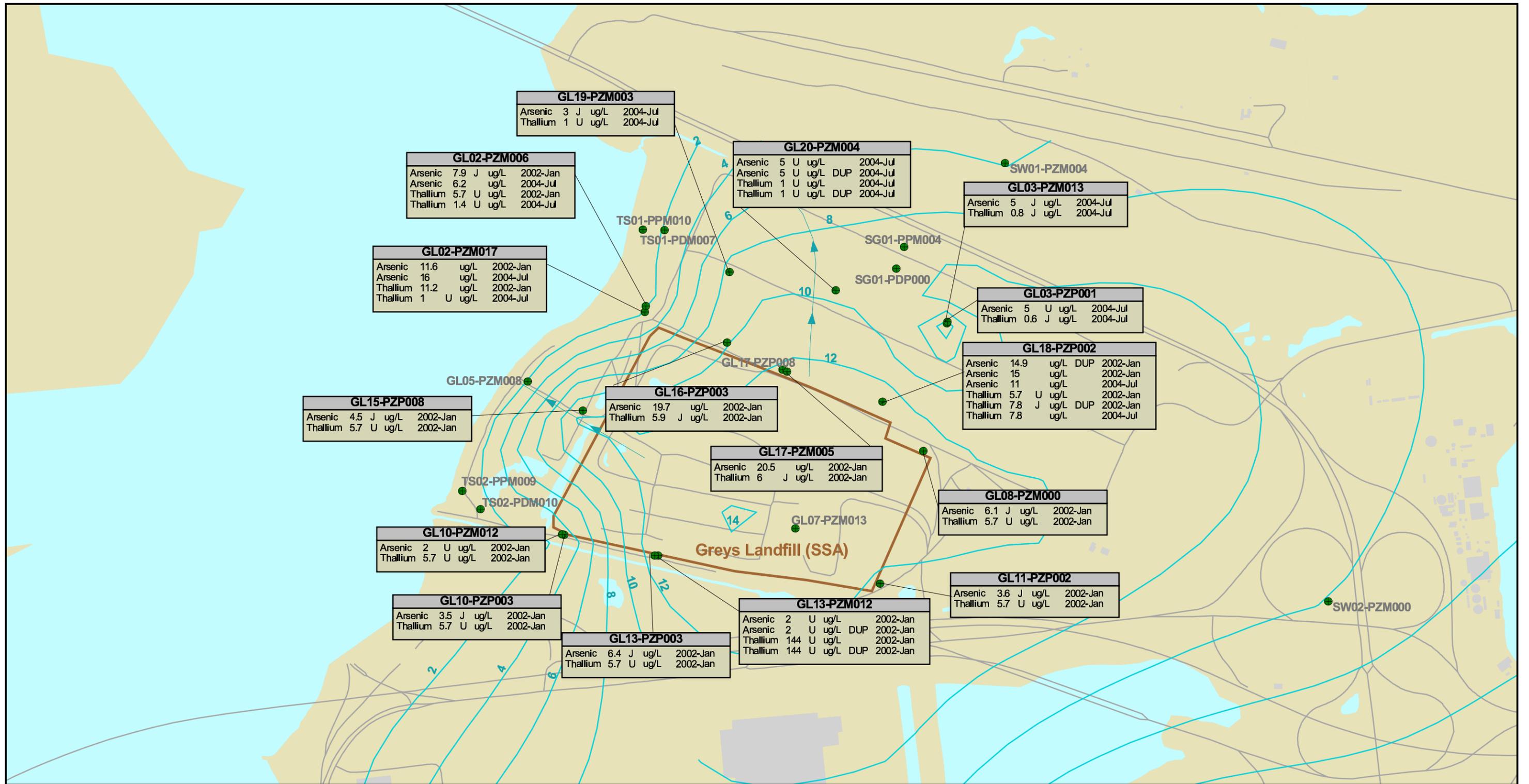
ISG Sparrows Point, Inc.
 Greys Landfill
 Shallow Groundwater Zone
 Benzene and Naphthalene Results



Figure:
4-1

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





GL19-PZM003

| | | | | |
|----------|---|---|------|----------|
| Arsenic | 3 | J | ug/L | 2004-Jul |
| Thallium | 1 | U | ug/L | 2004-Jul |

GL02-PZM006

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 7.9 | J | ug/L | 2002-Jan |
| Arsenic | 6.2 | | ug/L | 2004-Jul |
| Thallium | 5.7 | U | ug/L | 2002-Jan |
| Thallium | 1.4 | U | ug/L | 2004-Jul |

GL20-PZM004

| | | | | |
|----------|---|---|------|--------------|
| Arsenic | 5 | U | ug/L | 2004-Jul |
| Arsenic | 5 | U | ug/L | DUP 2004-Jul |
| Thallium | 1 | U | ug/L | 2004-Jul |
| Thallium | 1 | U | ug/L | DUP 2004-Jul |

GL03-PZM013

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 5 | J | ug/L | 2004-Jul |
| Thallium | 0.8 | J | ug/L | 2004-Jul |

GL02-PZM017

| | | | | |
|----------|------|---|------|----------|
| Arsenic | 11.6 | | ug/L | 2002-Jan |
| Arsenic | 16 | | ug/L | 2004-Jul |
| Thallium | 11.2 | | ug/L | 2002-Jan |
| Thallium | 1 | U | ug/L | 2004-Jul |

GL03-PZP001

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 5 | U | ug/L | 2004-Jul |
| Thallium | 0.6 | J | ug/L | 2004-Jul |

GL15-PZP008

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 4.5 | J | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL16-PZP003

| | | | | |
|----------|------|---|------|----------|
| Arsenic | 19.7 | | ug/L | 2002-Jan |
| Thallium | 5.9 | J | ug/L | 2002-Jan |

GL18-PZP002

| | | | | |
|----------|------|---|------|--------------|
| Arsenic | 14.9 | | ug/L | DUP 2002-Jan |
| Arsenic | 15 | | ug/L | 2002-Jan |
| Arsenic | 11 | | ug/L | 2004-Jul |
| Thallium | 5.7 | U | ug/L | 2002-Jan |
| Thallium | 7.8 | J | ug/L | DUP 2002-Jan |
| Thallium | 7.8 | | ug/L | 2004-Jul |

GL17-PZM005

| | | | | |
|----------|------|---|------|----------|
| Arsenic | 20.5 | | ug/L | 2002-Jan |
| Thallium | 6 | J | ug/L | 2002-Jan |

GL08-PZM000

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 6.1 | J | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL10-PZM012

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 2 | U | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL07-PZM013

| | | | | |
|----------|-----|---|------|--------------|
| Arsenic | 2 | U | ug/L | 2002-Jan |
| Arsenic | 2 | U | ug/L | DUP 2002-Jan |
| Thallium | 144 | U | ug/L | 2002-Jan |
| Thallium | 144 | U | ug/L | DUP 2002-Jan |

GL11-PZP002

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 3.6 | J | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL10-PZP003

| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 3.5 | J | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL13-PZP003

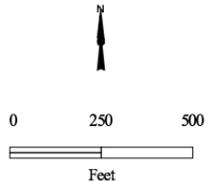
| | | | | |
|----------|-----|---|------|----------|
| Arsenic | 6.4 | J | ug/L | 2002-Jan |
| Thallium | 5.7 | U | ug/L | 2002-Jan |

GL13-PZM012

| | | | | |
|----------|-----|---|------|--------------|
| Arsenic | 2 | U | ug/L | 2002-Jan |
| Arsenic | 2 | U | ug/L | DUP 2002-Jan |
| Thallium | 144 | U | ug/L | 2002-Jan |
| Thallium | 144 | U | ug/L | DUP 2002-Jan |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



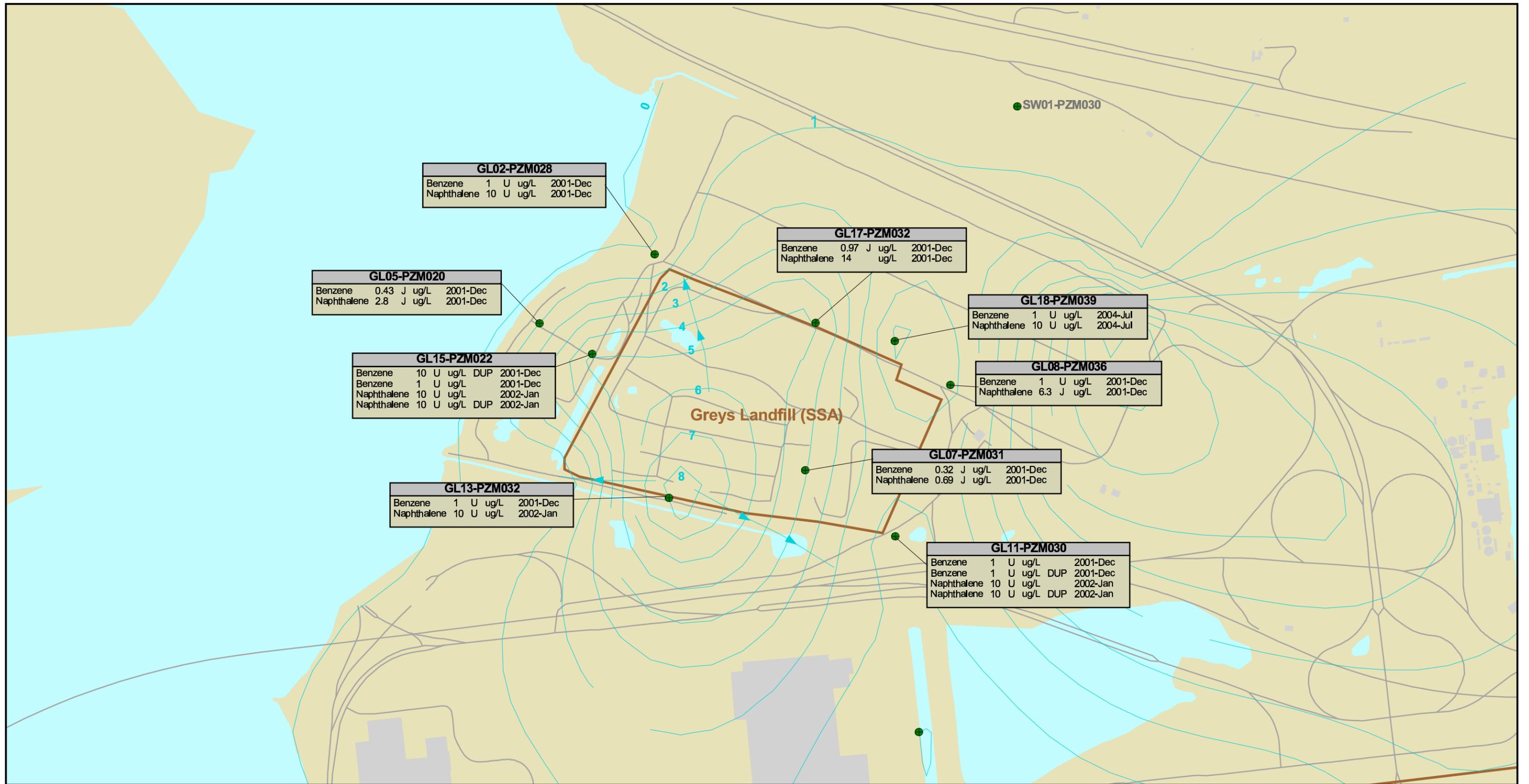
ISG Sparrows Point, Inc.
 Greys Landfill
 Shallow Groundwater Zone
 Total Arsenic and Thallium Results



Figure:
4-2

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





GL02-PZM028

| | | | | |
|-------------|----|---|------|----------|
| Benzene | 1 | U | ug/L | 2001-Dec |
| Naphthalene | 10 | U | ug/L | 2001-Dec |

GL05-PZM020

| | | | | |
|-------------|------|---|------|----------|
| Benzene | 0.43 | J | ug/L | 2001-Dec |
| Naphthalene | 2.8 | J | ug/L | 2001-Dec |

GL17-PZM032

| | | | | |
|-------------|------|---|------|----------|
| Benzene | 0.97 | J | ug/L | 2001-Dec |
| Naphthalene | 14 | | ug/L | 2001-Dec |

GL18-PZM039

| | | | | |
|-------------|----|---|------|----------|
| Benzene | 1 | U | ug/L | 2004-Jul |
| Naphthalene | 10 | U | ug/L | 2004-Jul |

GL15-PZM022

| | | | | | |
|-------------|----|---|------|-----|----------|
| Benzene | 10 | U | ug/L | DUP | 2001-Dec |
| Benzene | 1 | U | ug/L | | 2001-Dec |
| Naphthalene | 10 | U | ug/L | | 2002-Jan |
| Naphthalene | 10 | U | ug/L | DUP | 2002-Jan |

GL08-PZM036

| | | | | |
|-------------|-----|---|------|----------|
| Benzene | 1 | U | ug/L | 2001-Dec |
| Naphthalene | 6.3 | J | ug/L | 2001-Dec |

GL13-PZM032

| | | | | |
|-------------|----|---|------|----------|
| Benzene | 1 | U | ug/L | 2001-Dec |
| Naphthalene | 10 | U | ug/L | 2002-Jan |

GL07-PZM031

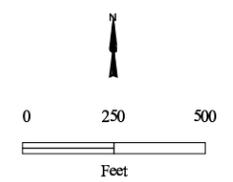
| | | | | |
|-------------|------|---|------|----------|
| Benzene | 0.32 | J | ug/L | 2001-Dec |
| Naphthalene | 0.69 | J | ug/L | 2001-Dec |

GL11-PZM030

| | | | | | |
|-------------|----|---|------|----------|----------|
| Benzene | 1 | U | ug/L | 2001-Dec | |
| Benzene | 1 | U | ug/L | DUP | 2001-Dec |
| Naphthalene | 10 | U | ug/L | 2002-Jan | |
| Naphthalene | 10 | U | ug/L | DUP | 2002-Jan |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



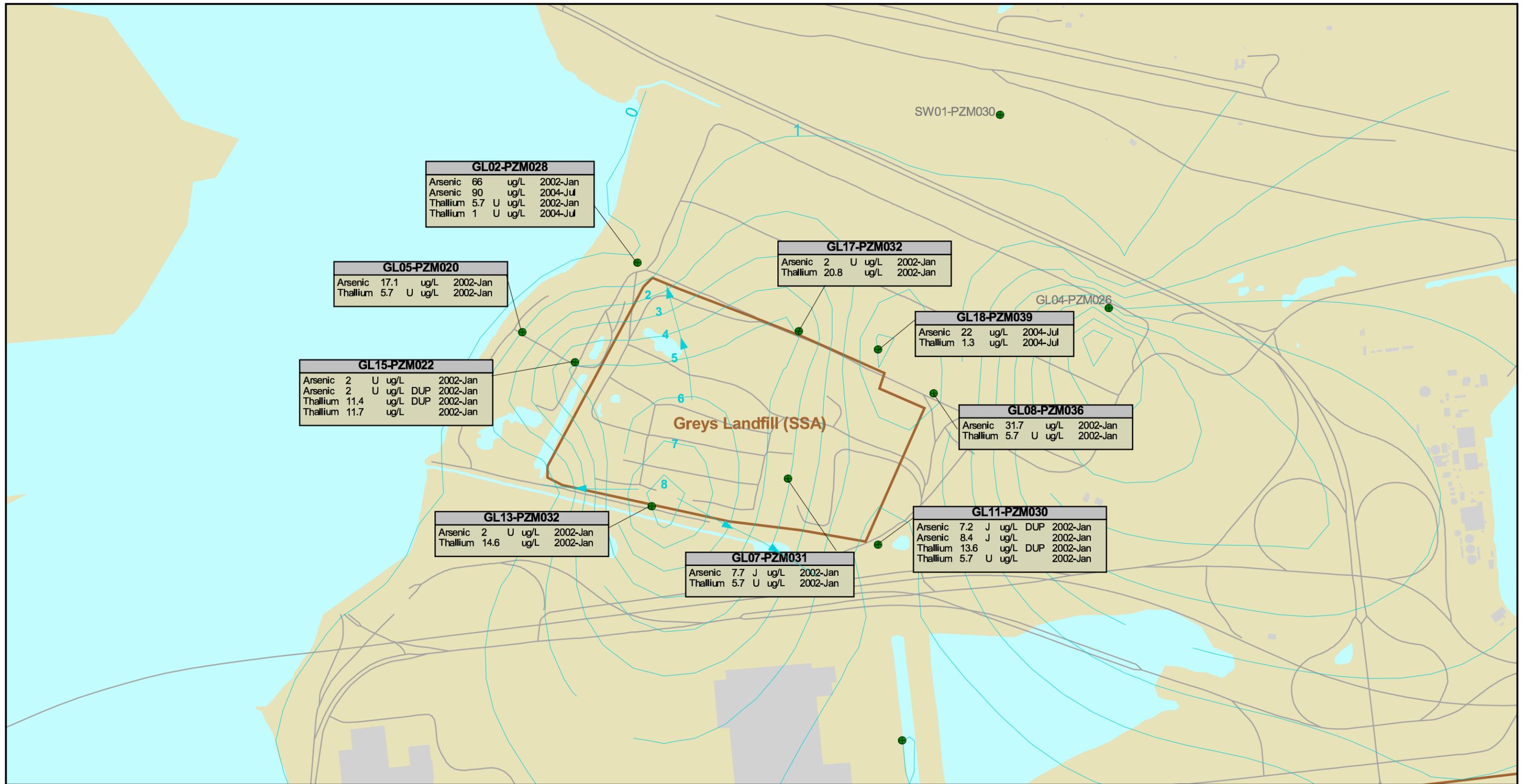
ISG Sparrows Point, Inc.
 Greys Landfill
 Intermediate Groundwater Zone
 Benzene and Naphthalene Results



Figure:
4-3

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





GL02-PZM028

| | | | |
|----------|-----|--------|----------|
| Arsenic | 66 | ug/L | 2002-Jan |
| Arsenic | 90 | ug/L | 2004-Jul |
| Thallium | 5.7 | U ug/L | 2002-Jan |
| Thallium | 1 | U ug/L | 2004-Jul |

GL05-PZM020

| | | | |
|----------|------|--------|----------|
| Arsenic | 17.1 | ug/L | 2002-Jan |
| Thallium | 5.7 | U ug/L | 2002-Jan |

GL15-PZM022

| | | | |
|----------|------|--------|--------------|
| Arsenic | 2 | U ug/L | 2002-Jan |
| Arsenic | 2 | U ug/L | DUP 2002-Jan |
| Thallium | 11.4 | ug/L | DUP 2002-Jan |
| Thallium | 11.7 | ug/L | 2002-Jan |

GL13-PZM032

| | | | |
|----------|------|--------|----------|
| Arsenic | 2 | U ug/L | 2002-Jan |
| Thallium | 14.6 | ug/L | 2002-Jan |

GL07-PZM031

| | | | |
|----------|-----|--------|----------|
| Arsenic | 7.7 | J ug/L | 2002-Jan |
| Thallium | 5.7 | U ug/L | 2002-Jan |

GL17-PZM032

| | | | |
|----------|------|--------|----------|
| Arsenic | 2 | U ug/L | 2002-Jan |
| Thallium | 20.8 | ug/L | 2002-Jan |

GL18-PZM039

| | | | |
|----------|-----|------|----------|
| Arsenic | 22 | ug/L | 2004-Jul |
| Thallium | 1.3 | ug/L | 2004-Jul |

GL08-PZM036

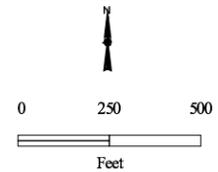
| | | | |
|----------|------|--------|----------|
| Arsenic | 31.7 | ug/L | 2002-Jan |
| Thallium | 5.7 | U ug/L | 2002-Jan |

GL11-PZM030

| | | | |
|----------|------|--------|--------------|
| Arsenic | 7.2 | J ug/L | DUP 2002-Jan |
| Arsenic | 8.4 | J ug/L | 2002-Jan |
| Thallium | 13.6 | ug/L | DUP 2002-Jan |
| Thallium | 5.7 | U ug/L | 2002-Jan |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



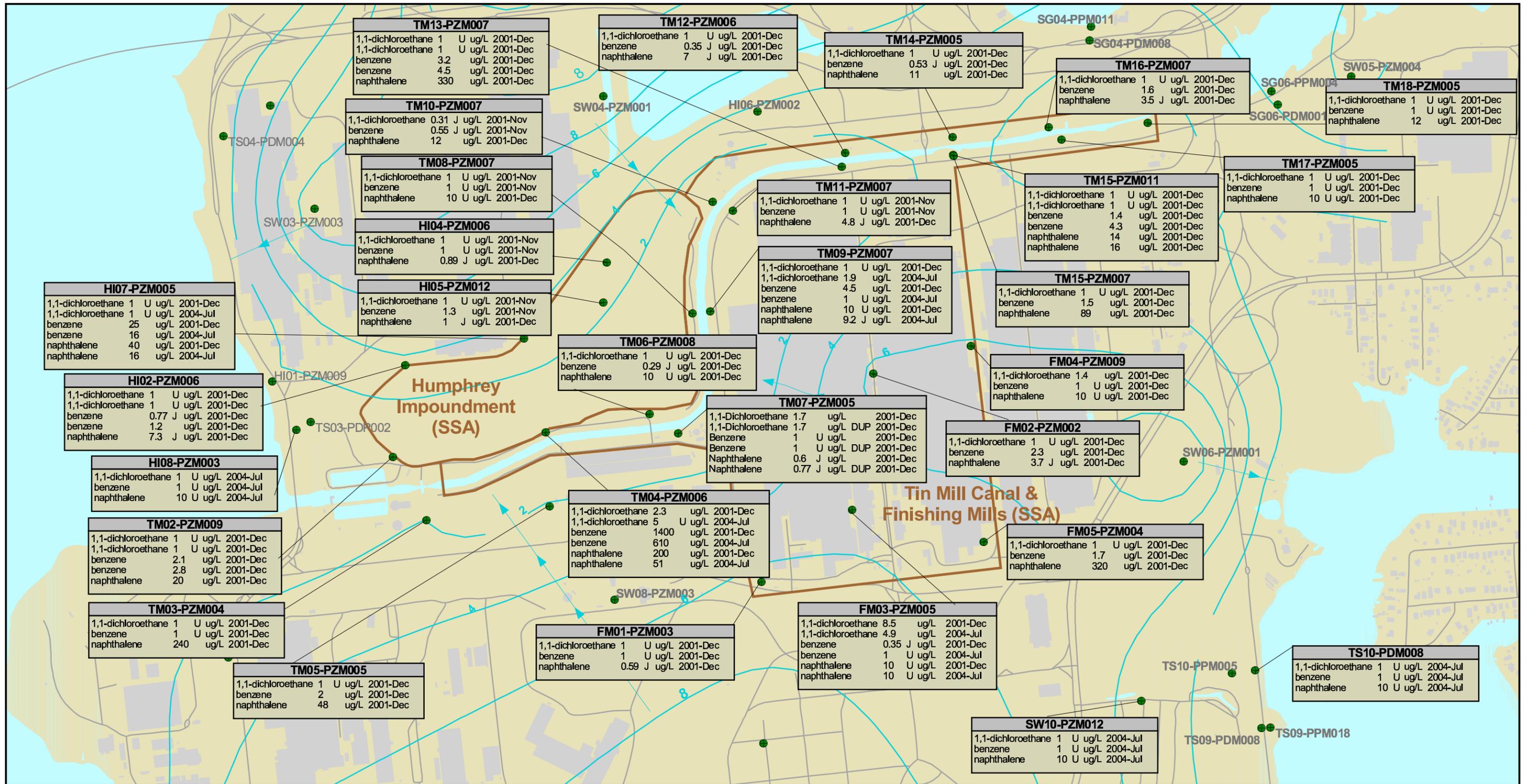
ISG Sparrows Point, Inc.
 Greys Landfill
 Intermediate Groundwater Zone
 Total Arsenic and Thallium Results



Figure:
4-4

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

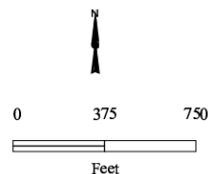




ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Shallow Groundwater Zone
 1,1-Dichloroethane, Benzene, and Naphthalene Results

● Monitoring Well Location
 Study Area Boundary
 Water Feature
 Groundwater contour feet above MSL (2 Foot Intervals)
 Groundwater Flow Direction

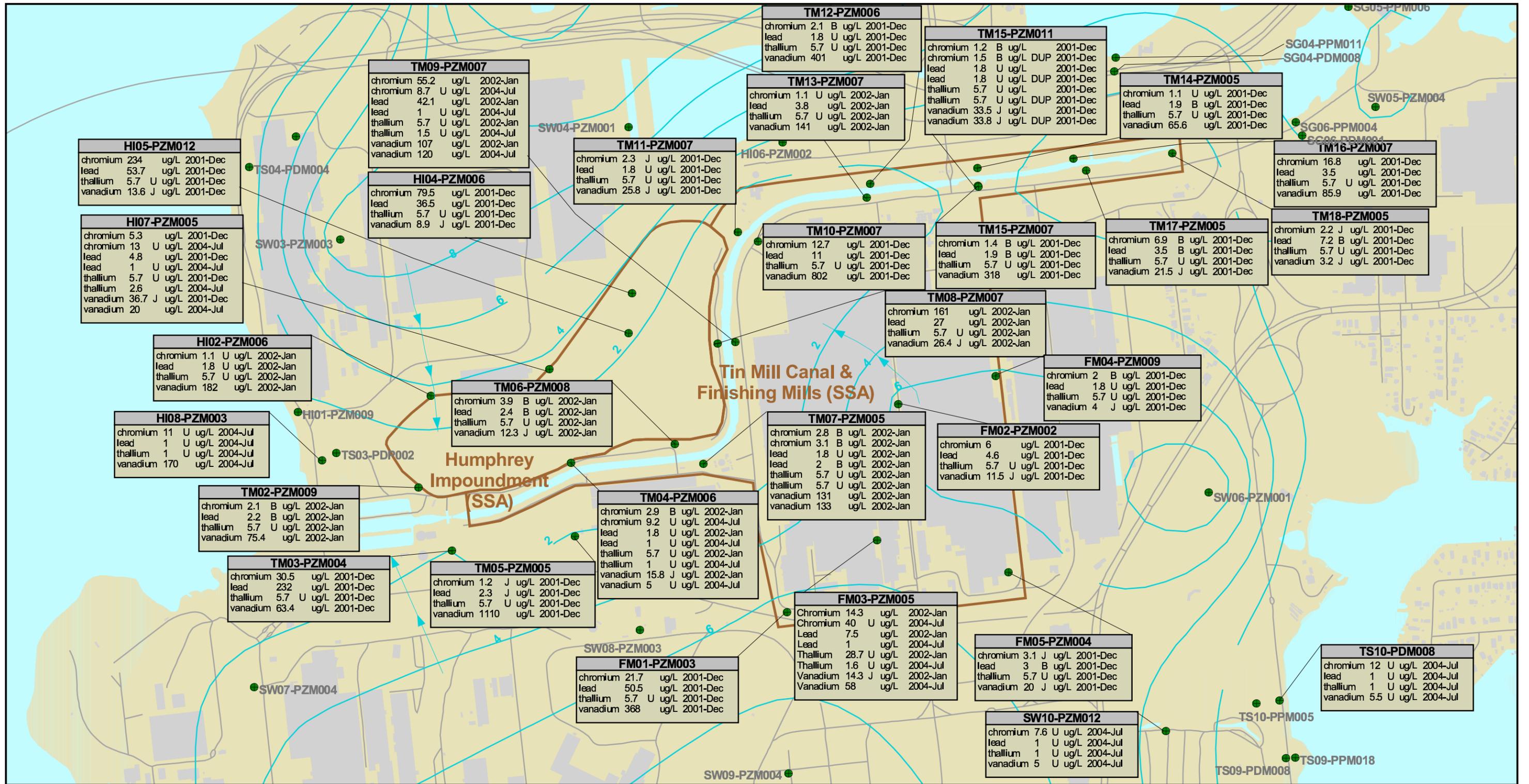
D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

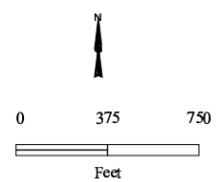
Figure:
 4-5





- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



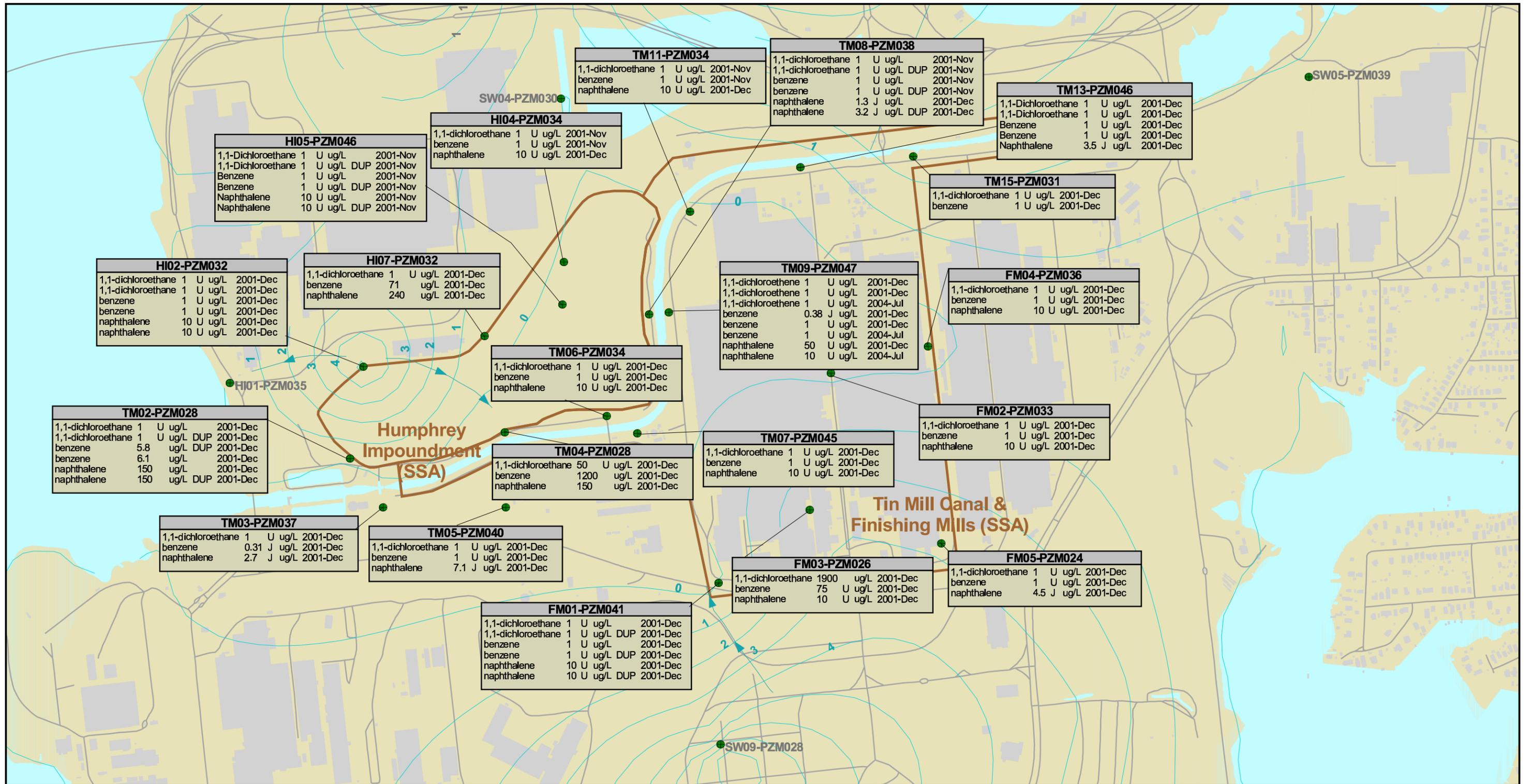
ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Shallow Groundwater Zone
 Total Chromium, Lead, Thallium and Vanadium Results



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

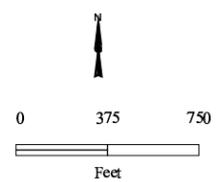


Figure:
4-6



Monitoring Well Location
 Study Area Boundary
 Water Feature
 Groundwater contour feet above MSL (1 Foot Intervals)
 Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

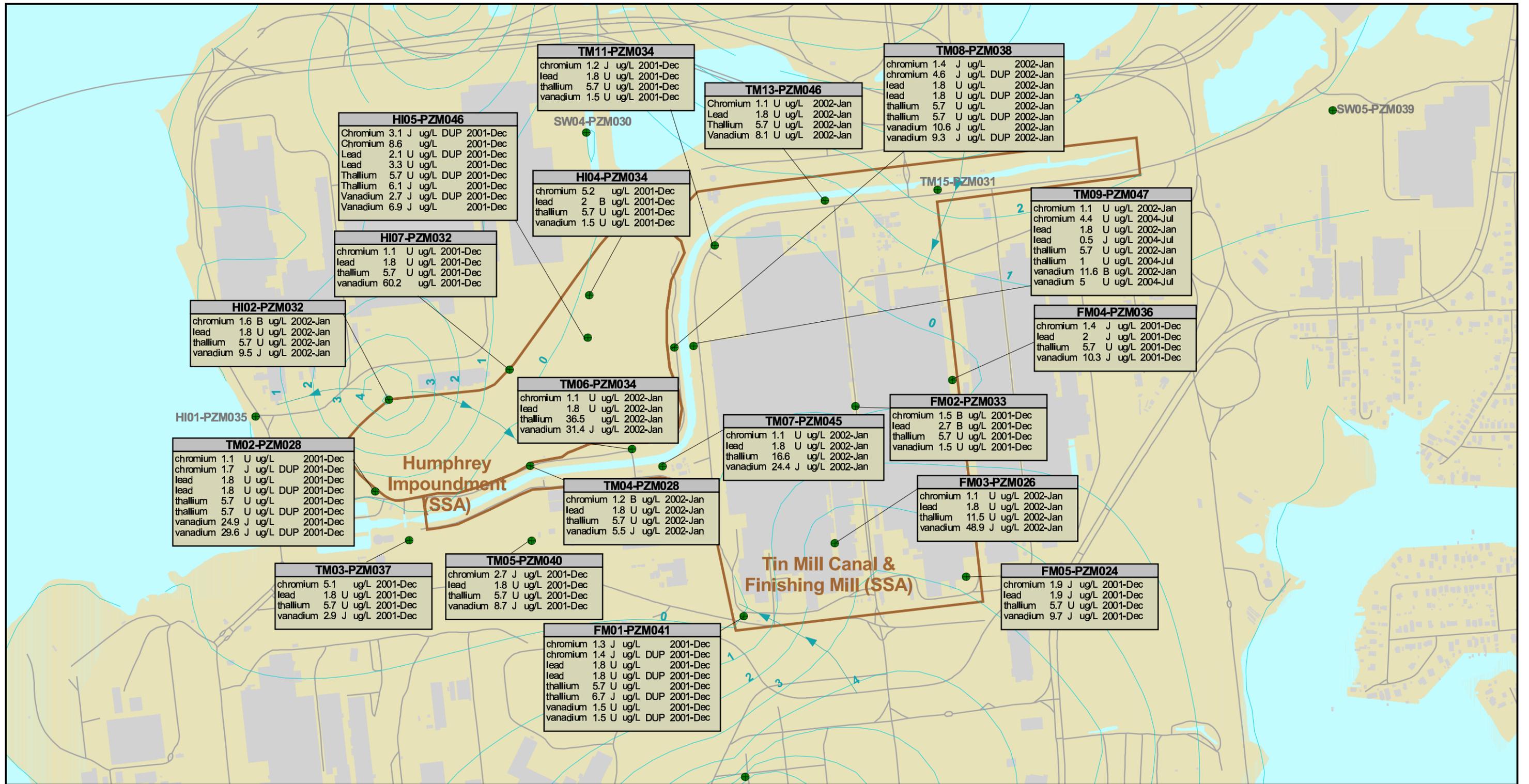


ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Intermediate Groundwater Zone
 1,1-Dichloroethane, Benzene, and Naphthalene Results



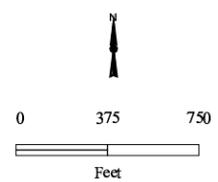
Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

Figure: 4-7



● Monitoring Well Location
 Study Area Boundary
 Water Feature
 Groundwater contour feet above MSL (1 Foot Intervals)
 Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



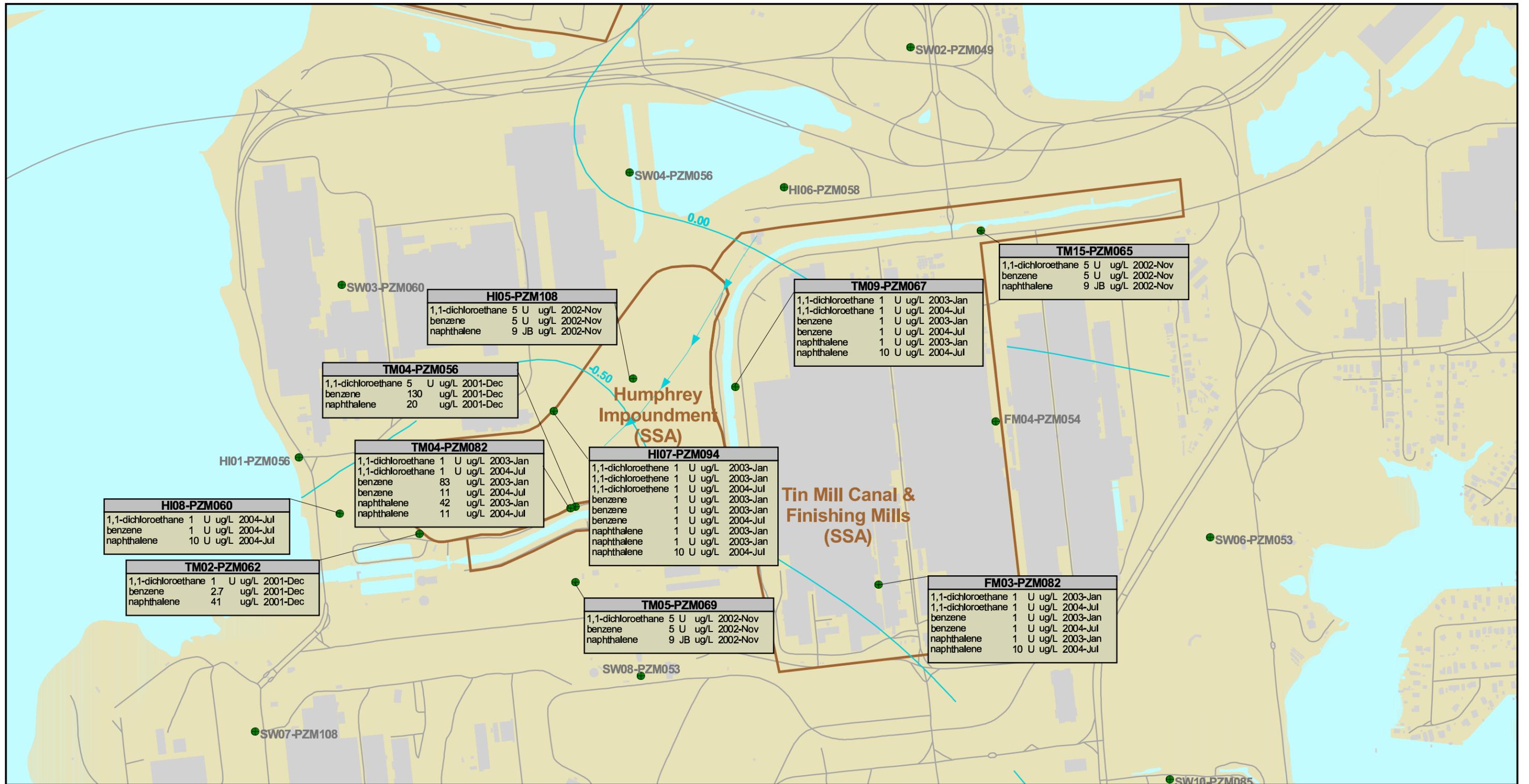
ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Intermediate Groundwater Zone
 Total Chromium, Lead, Thallium and Vanadium



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.



Figure: 4-8



HI08-PZM060

| | | | | |
|--------------------|----|---|------|----------|
| 1,1-dichloroethane | 1 | U | ug/L | 2004-Jul |
| benzene | 1 | U | ug/L | 2004-Jul |
| naphthalene | 10 | U | ug/L | 2004-Jul |

TM04-PZM056

| | | | | |
|--------------------|-----|------|----------|----------|
| 1,1-dichloroethane | 5 | U | ug/L | 2001-Dec |
| benzene | 130 | ug/L | 2001-Dec | |
| naphthalene | 20 | ug/L | 2001-Dec | |

TM04-PZM082

| | | | | |
|--------------------|----|------|----------|----------|
| 1,1-dichloroethane | 1 | U | ug/L | 2003-Jan |
| 1,1-dichloroethane | 1 | U | ug/L | 2004-Jul |
| benzene | 83 | ug/L | 2003-Jan | |
| benzene | 11 | ug/L | 2004-Jul | |
| naphthalene | 42 | ug/L | 2003-Jan | |
| naphthalene | 11 | ug/L | 2004-Jul | |

HI05-PZM108

| | | | | |
|--------------------|---|----|------|----------|
| 1,1-dichloroethane | 5 | U | ug/L | 2002-Nov |
| benzene | 5 | U | ug/L | 2002-Nov |
| naphthalene | 9 | JB | ug/L | 2002-Nov |

HI07-PZM094

| | | | | |
|--------------------|----|---|------|----------|
| 1,1-dichloroethane | 1 | U | ug/L | 2003-Jan |
| 1,1-dichloroethane | 1 | U | ug/L | 2003-Jan |
| 1,1-dichloroethane | 1 | U | ug/L | 2004-Jul |
| benzene | 1 | U | ug/L | 2003-Jan |
| benzene | 1 | U | ug/L | 2003-Jan |
| benzene | 1 | U | ug/L | 2004-Jul |
| naphthalene | 1 | U | ug/L | 2003-Jan |
| naphthalene | 1 | U | ug/L | 2003-Jan |
| naphthalene | 10 | U | ug/L | 2004-Jul |

TM05-PZM069

| | | | | |
|--------------------|---|----|------|----------|
| 1,1-dichloroethane | 5 | U | ug/L | 2002-Nov |
| benzene | 5 | U | ug/L | 2002-Nov |
| naphthalene | 9 | JB | ug/L | 2002-Nov |

TM09-PZM067

| | | | | |
|--------------------|----|---|------|----------|
| 1,1-dichloroethane | 1 | U | ug/L | 2003-Jan |
| 1,1-dichloroethane | 1 | U | ug/L | 2004-Jul |
| benzene | 1 | U | ug/L | 2003-Jan |
| benzene | 1 | U | ug/L | 2004-Jul |
| naphthalene | 1 | U | ug/L | 2003-Jan |
| naphthalene | 10 | U | ug/L | 2004-Jul |

TM15-PZM065

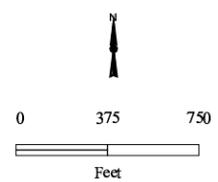
| | | | | |
|--------------------|---|----|------|----------|
| 1,1-dichloroethane | 5 | U | ug/L | 2002-Nov |
| benzene | 5 | U | ug/L | 2002-Nov |
| naphthalene | 9 | JB | ug/L | 2002-Nov |

FM03-PZM082

| | | | | |
|--------------------|----|---|------|----------|
| 1,1-dichloroethane | 1 | U | ug/L | 2003-Jan |
| 1,1-dichloroethane | 1 | U | ug/L | 2004-Jul |
| benzene | 1 | U | ug/L | 2003-Jan |
| benzene | 1 | U | ug/L | 2004-Jul |
| naphthalene | 1 | U | ug/L | 2003-Jan |
| naphthalene | 10 | U | ug/L | 2004-Jul |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1/2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

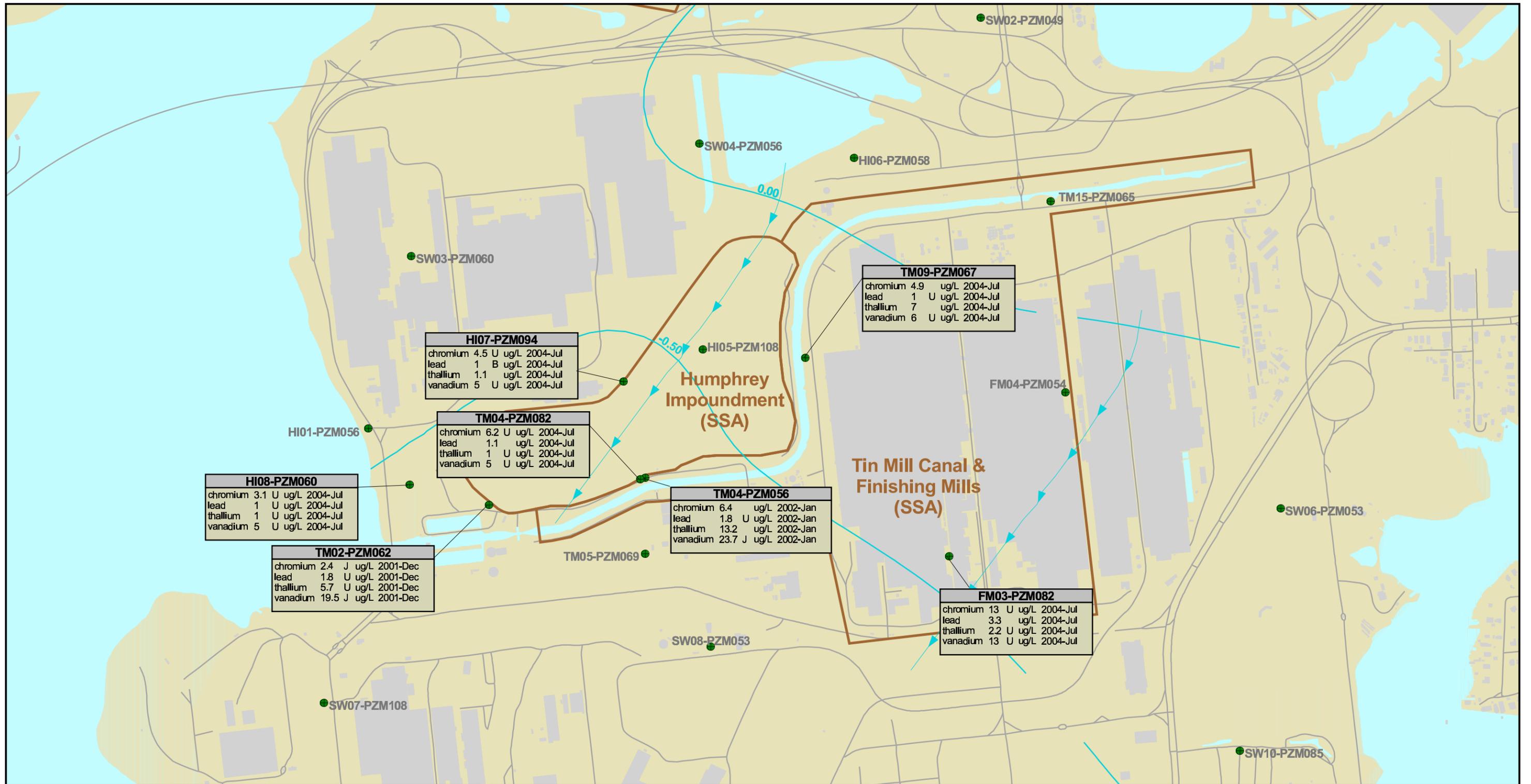


ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Lower Groundwater Zone
 1,1-Dichloroethane, Benzene, and Naphthalene Results



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

Figure: 4-9



HI08-PZM060

| | | | | |
|----------|-----|---|------|----------|
| chromium | 3.1 | U | ug/L | 2004-Jul |
| lead | 1 | U | ug/L | 2004-Jul |
| thallium | 1 | U | ug/L | 2004-Jul |
| vanadium | 5 | U | ug/L | 2004-Jul |

TM02-PZM062

| | | | | |
|----------|------|---|------|----------|
| chromium | 2.4 | J | ug/L | 2001-Dec |
| lead | 1.8 | U | ug/L | 2001-Dec |
| thallium | 5.7 | U | ug/L | 2001-Dec |
| vanadium | 19.5 | J | ug/L | 2001-Dec |

HI07-PZM094

| | | | | |
|----------|-----|------|----------|----------|
| chromium | 4.5 | U | ug/L | 2004-Jul |
| lead | 1 | B | ug/L | 2004-Jul |
| thallium | 1.1 | ug/L | 2004-Jul | |
| vanadium | 5 | U | ug/L | 2004-Jul |

TM04-PZM082

| | | | | |
|----------|-----|------|----------|----------|
| chromium | 6.2 | U | ug/L | 2004-Jul |
| lead | 1.1 | ug/L | 2004-Jul | |
| thallium | 1 | U | ug/L | 2004-Jul |
| vanadium | 5 | U | ug/L | 2004-Jul |

TM04-PZM056

| | | | | |
|----------|------|------|----------|----------|
| chromium | 6.4 | ug/L | 2002-Jan | |
| lead | 1.8 | U | ug/L | 2002-Jan |
| thallium | 13.2 | ug/L | 2002-Jan | |
| vanadium | 23.7 | J | ug/L | 2002-Jan |

TM09-PZM067

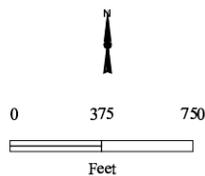
| | | | | |
|----------|-----|------|----------|----------|
| chromium | 4.9 | ug/L | 2004-Jul | |
| lead | 1 | U | ug/L | 2004-Jul |
| thallium | 7 | ug/L | 2004-Jul | |
| vanadium | 6 | U | ug/L | 2004-Jul |

FM03-PZM082

| | | | | |
|----------|-----|------|----------|----------|
| chromium | 13 | U | ug/L | 2004-Jul |
| lead | 3.3 | ug/L | 2004-Jul | |
| thallium | 2.2 | U | ug/L | 2004-Jul |
| vanadium | 13 | U | ug/L | 2004-Jul |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1/2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



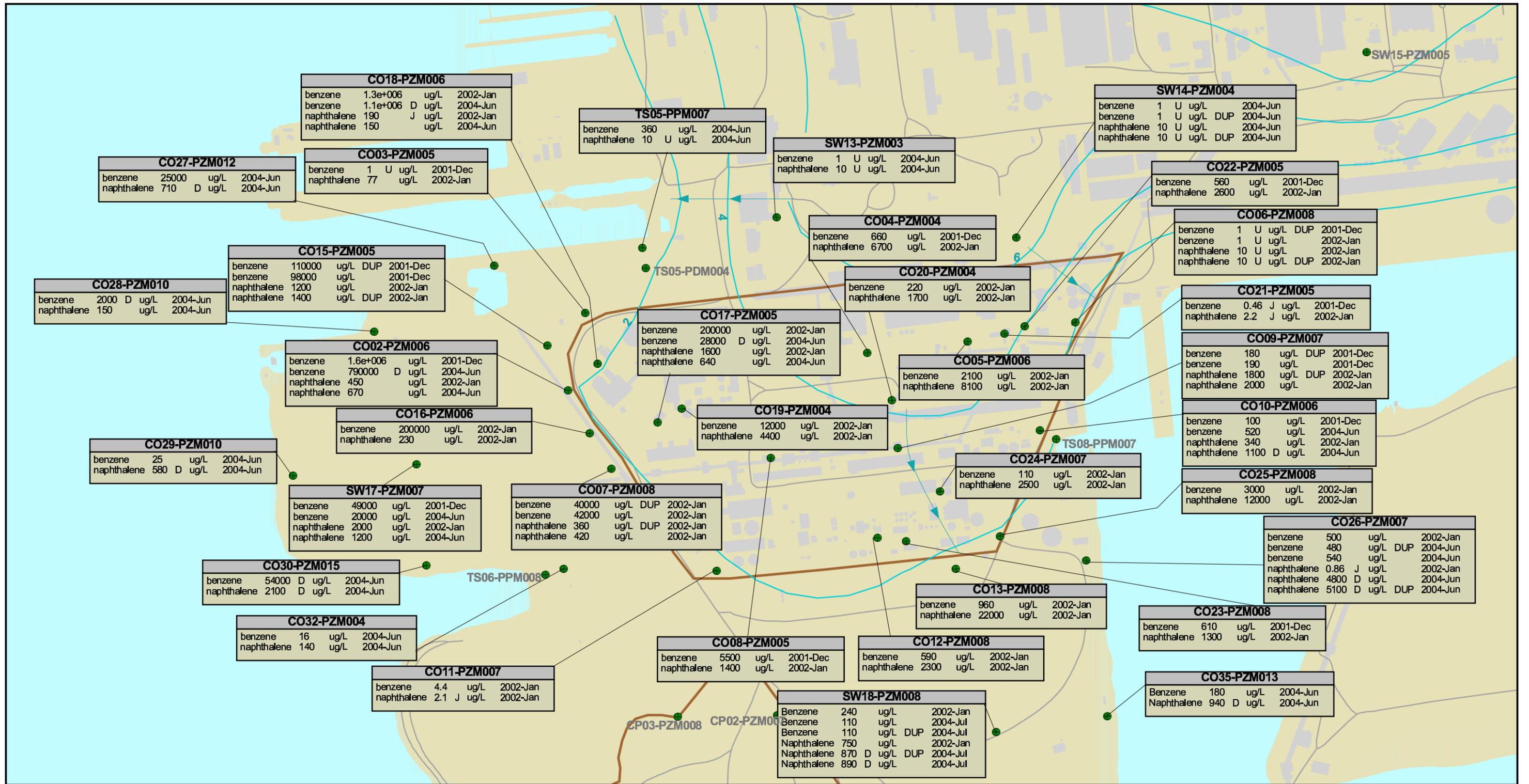
ISG Sparrows Point, Inc.
 Humphrey Impoundment / Tin Mill Canal / Finishing Mills
 Lower Groundwater Zone
 Total Chromium, Lead, Thallium and Vanadium



Figure:
4-10

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





● Monitoring Well Location
 Study Area Boundary
 Water Feature
 Groundwater contour feet above MSL (2 Foot Intervals)
 Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

0 250 500
 Feet

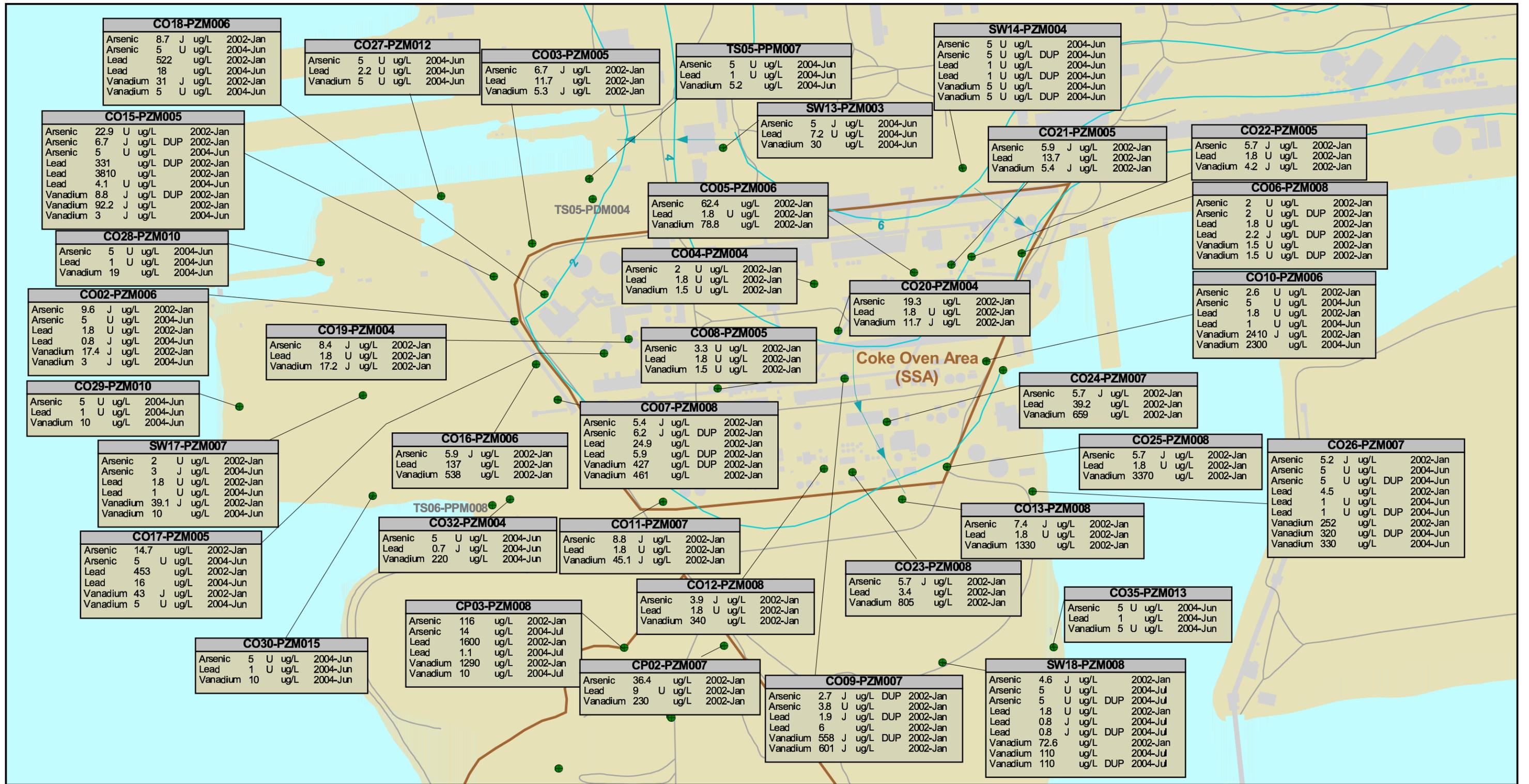
ISG Sparrows Point, Inc.
 Coke Oven Area
 Shallow Groundwater Zone
 Benzene and Naphthalene



Figure: 4-11

Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

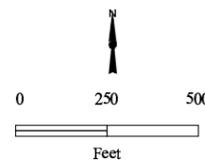




ISG Sparrows Point, Inc.
Coke Oven Area
Shallow Groundwater Zone
Total Arsenic, Lead and Vanadium

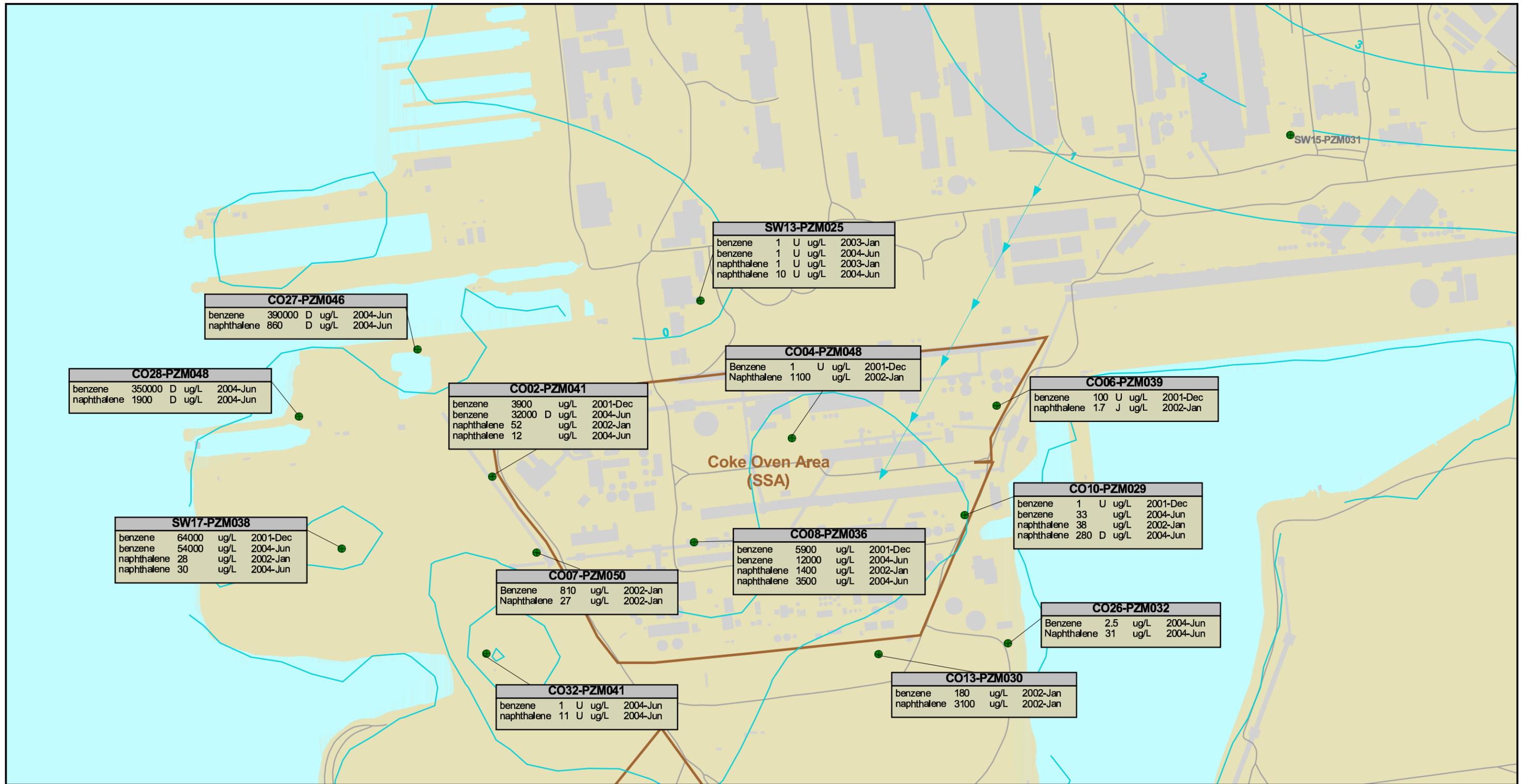
Figure:
4-12

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





CO27-PZM046

| | | | | |
|-------------|--------|---|------|----------|
| benzene | 390000 | D | ug/L | 2004-Jun |
| naphthalene | 860 | D | ug/L | 2004-Jun |

SW13-PZM025

| | | | | |
|-------------|----|---|------|----------|
| benzene | 1 | U | ug/L | 2003-Jan |
| benzene | 1 | U | ug/L | 2004-Jun |
| naphthalene | 1 | U | ug/L | 2003-Jan |
| naphthalene | 10 | U | ug/L | 2004-Jun |

CO28-PZM048

| | | | | |
|-------------|--------|---|------|----------|
| benzene | 350000 | D | ug/L | 2004-Jun |
| naphthalene | 1900 | D | ug/L | 2004-Jun |

CO04-PZM048

| | | | | |
|-------------|------|---|------|----------|
| Benzene | 1 | U | ug/L | 2001-Dec |
| Naphthalene | 1100 | | ug/L | 2002-Jan |

CO06-PZM039

| | | | | |
|-------------|-----|---|------|----------|
| benzene | 100 | U | ug/L | 2001-Dec |
| naphthalene | 1.7 | J | ug/L | 2002-Jan |

CO02-PZM041

| | | | | |
|-------------|-------|---|------|----------|
| benzene | 3900 | | ug/L | 2001-Dec |
| benzene | 32000 | D | ug/L | 2004-Jun |
| naphthalene | 52 | | ug/L | 2002-Jan |
| naphthalene | 12 | | ug/L | 2004-Jun |

SW17-PZM038

| | | | | |
|-------------|-------|--|------|----------|
| benzene | 64000 | | ug/L | 2001-Dec |
| benzene | 54000 | | ug/L | 2004-Jun |
| naphthalene | 28 | | ug/L | 2002-Jan |
| naphthalene | 30 | | ug/L | 2004-Jun |

Coke Oven Area (SSA)

CO10-PZM029

| | | | | |
|-------------|-----|---|------|----------|
| benzene | 1 | U | ug/L | 2001-Dec |
| benzene | 33 | | ug/L | 2004-Jun |
| naphthalene | 38 | | ug/L | 2002-Jan |
| naphthalene | 280 | D | ug/L | 2004-Jun |

CO08-PZM036

| | | | | |
|-------------|-------|--|------|----------|
| benzene | 5900 | | ug/L | 2001-Dec |
| benzene | 12000 | | ug/L | 2004-Jun |
| naphthalene | 1400 | | ug/L | 2002-Jan |
| naphthalene | 3500 | | ug/L | 2004-Jun |

CO07-PZM050

| | | | | |
|-------------|-----|--|------|----------|
| Benzene | 810 | | ug/L | 2002-Jan |
| Naphthalene | 27 | | ug/L | 2002-Jan |

CO26-PZM032

| | | | | |
|-------------|-----|--|------|----------|
| Benzene | 2.5 | | ug/L | 2004-Jun |
| Naphthalene | 31 | | ug/L | 2004-Jun |

CO32-PZM041

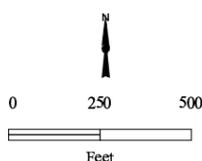
| | | | | |
|-------------|----|---|------|----------|
| benzene | 1 | U | ug/L | 2004-Jun |
| naphthalene | 11 | U | ug/L | 2004-Jun |

CO13-PZM030

| | | | | |
|-------------|------|--|------|----------|
| benzene | 180 | | ug/L | 2002-Jan |
| naphthalene | 3100 | | ug/L | 2002-Jan |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

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 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



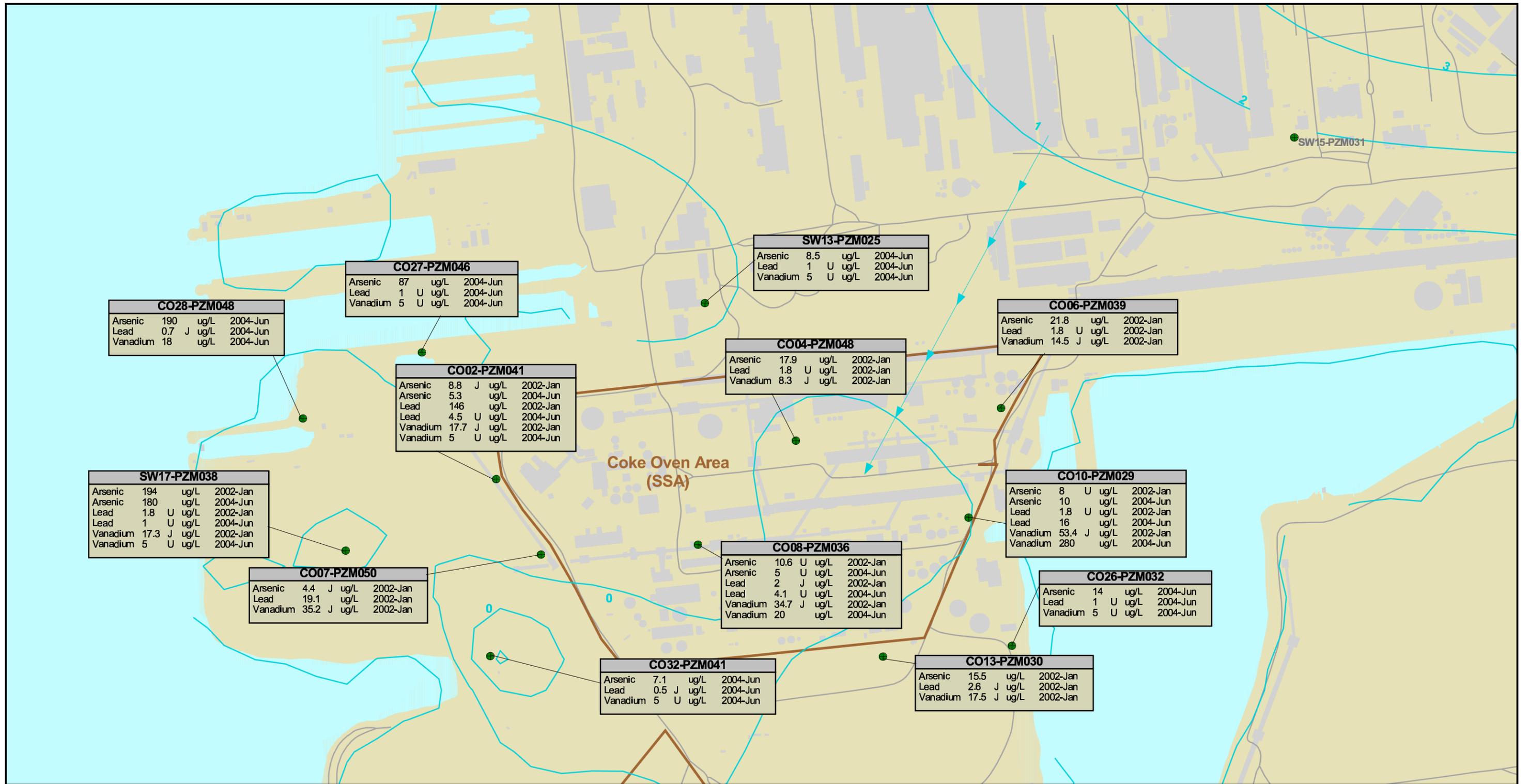
ISG Sparrows Point, Inc.
 Coke Oven Area
 Intermediate Groundwater Zone
 Benzene and Naphthalene



Figure:
4-13

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





CO28-PZM048

| | | | |
|----------|-----|--------|----------|
| Arsenic | 190 | ug/L | 2004-Jun |
| Lead | 0.7 | J ug/L | 2004-Jun |
| Vanadium | 18 | ug/L | 2004-Jun |

CO27-PZM046

| | | | |
|----------|----|--------|----------|
| Arsenic | 87 | ug/L | 2004-Jun |
| Lead | 1 | U ug/L | 2004-Jun |
| Vanadium | 5 | U ug/L | 2004-Jun |

SW13-PZM025

| | | | |
|----------|-----|--------|----------|
| Arsenic | 8.5 | ug/L | 2004-Jun |
| Lead | 1 | U ug/L | 2004-Jun |
| Vanadium | 5 | U ug/L | 2004-Jun |

CO06-PZM039

| | | | |
|----------|------|--------|----------|
| Arsenic | 21.8 | ug/L | 2002-Jan |
| Lead | 1.8 | U ug/L | 2002-Jan |
| Vanadium | 14.5 | J ug/L | 2002-Jan |

CO02-PZM041

| | | | |
|----------|------|--------|----------|
| Arsenic | 8.8 | J ug/L | 2002-Jan |
| Arsenic | 5.3 | ug/L | 2004-Jun |
| Lead | 146 | ug/L | 2002-Jan |
| Lead | 4.5 | U ug/L | 2004-Jun |
| Vanadium | 17.7 | J ug/L | 2002-Jan |
| Vanadium | 5 | U ug/L | 2004-Jun |

CO04-PZM048

| | | | |
|----------|------|--------|----------|
| Arsenic | 17.9 | ug/L | 2002-Jan |
| Lead | 1.8 | U ug/L | 2002-Jan |
| Vanadium | 8.3 | J ug/L | 2002-Jan |

SW17-PZM038

| | | | |
|----------|------|--------|----------|
| Arsenic | 194 | ug/L | 2002-Jan |
| Arsenic | 180 | ug/L | 2004-Jun |
| Lead | 1.8 | U ug/L | 2002-Jan |
| Lead | 1 | U ug/L | 2004-Jun |
| Vanadium | 17.3 | J ug/L | 2002-Jan |
| Vanadium | 5 | U ug/L | 2004-Jun |

CO07-PZM050

| | | | |
|----------|------|--------|----------|
| Arsenic | 4.4 | J ug/L | 2002-Jan |
| Lead | 19.1 | ug/L | 2002-Jan |
| Vanadium | 35.2 | J ug/L | 2002-Jan |

Coke Oven Area (SSA)

CO08-PZM036

| | | | |
|----------|------|--------|----------|
| Arsenic | 10.6 | U ug/L | 2002-Jan |
| Arsenic | 5 | U ug/L | 2004-Jun |
| Lead | 2 | J ug/L | 2002-Jan |
| Lead | 4.1 | U ug/L | 2004-Jun |
| Vanadium | 34.7 | J ug/L | 2002-Jan |
| Vanadium | 20 | ug/L | 2004-Jun |

CO10-PZM029

| | | | |
|----------|------|--------|----------|
| Arsenic | 8 | U ug/L | 2002-Jan |
| Arsenic | 10 | ug/L | 2004-Jun |
| Lead | 1.8 | U ug/L | 2002-Jan |
| Lead | 16 | ug/L | 2004-Jun |
| Vanadium | 53.4 | J ug/L | 2002-Jan |
| Vanadium | 280 | ug/L | 2004-Jun |

CO26-PZM032

| | | | |
|----------|----|--------|----------|
| Arsenic | 14 | ug/L | 2004-Jun |
| Lead | 1 | U ug/L | 2004-Jun |
| Vanadium | 5 | U ug/L | 2004-Jun |

CO32-PZM041

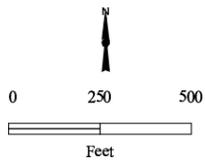
| | | | |
|----------|-----|--------|----------|
| Arsenic | 7.1 | ug/L | 2004-Jun |
| Lead | 0.5 | J ug/L | 2004-Jun |
| Vanadium | 5 | U ug/L | 2004-Jun |

CO13-PZM030

| | | | |
|----------|------|--------|----------|
| Arsenic | 15.5 | ug/L | 2002-Jan |
| Lead | 2.6 | J ug/L | 2002-Jan |
| Vanadium | 17.5 | J ug/L | 2002-Jan |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



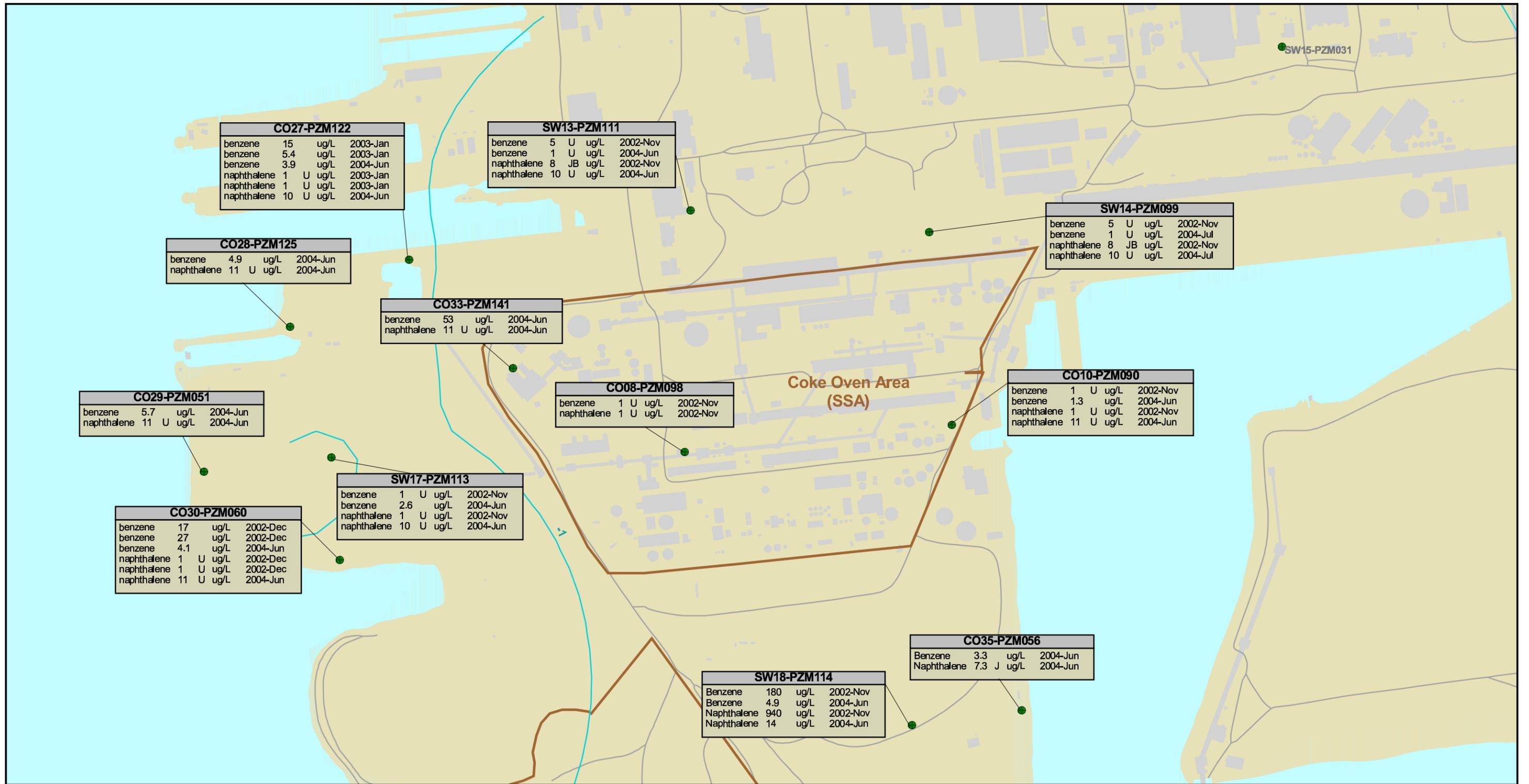
ISG Sparrows Point, Inc.
Coke Oven Area
Intermediate Groundwater Zone
Total Arsenic, Lead and Vanadium



Figure:
4-14

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





CO27-PZM122

| | | | |
|-------------|-----|--------|----------|
| benzene | 15 | ug/L | 2003-Jan |
| benzene | 5.4 | ug/L | 2003-Jan |
| benzene | 3.9 | ug/L | 2004-Jun |
| naphthalene | 1 | U ug/L | 2003-Jan |
| naphthalene | 1 | U ug/L | 2003-Jan |
| naphthalene | 10 | U ug/L | 2004-Jun |

SW13-PZM111

| | | | |
|-------------|----|---------|----------|
| benzene | 5 | U ug/L | 2002-Nov |
| benzene | 1 | U ug/L | 2004-Jun |
| naphthalene | 8 | JB ug/L | 2002-Nov |
| naphthalene | 10 | U ug/L | 2004-Jun |

SW14-PZM099

| | | | |
|-------------|----|---------|----------|
| benzene | 5 | U ug/L | 2002-Nov |
| benzene | 1 | U ug/L | 2004-Jul |
| naphthalene | 8 | JB ug/L | 2002-Nov |
| naphthalene | 10 | U ug/L | 2004-Jul |

CO28-PZM125

| | | | |
|-------------|-----|--------|----------|
| benzene | 4.9 | ug/L | 2004-Jun |
| naphthalene | 11 | U ug/L | 2004-Jun |

CO33-PZM141

| | | | |
|-------------|----|--------|----------|
| benzene | 53 | ug/L | 2004-Jun |
| naphthalene | 11 | U ug/L | 2004-Jun |

CO10-PZM090

| | | | |
|-------------|-----|--------|----------|
| benzene | 1 | U ug/L | 2002-Nov |
| benzene | 1.3 | ug/L | 2004-Jun |
| naphthalene | 1 | U ug/L | 2002-Nov |
| naphthalene | 11 | U ug/L | 2004-Jun |

CO29-PZM051

| | | | |
|-------------|-----|--------|----------|
| benzene | 5.7 | ug/L | 2004-Jun |
| naphthalene | 11 | U ug/L | 2004-Jun |

CO08-PZM098

| | | | |
|-------------|---|--------|----------|
| benzene | 1 | U ug/L | 2002-Nov |
| naphthalene | 1 | U ug/L | 2002-Nov |

SW17-PZM113

| | | | |
|-------------|-----|--------|----------|
| benzene | 1 | U ug/L | 2002-Nov |
| benzene | 2.6 | ug/L | 2004-Jun |
| naphthalene | 1 | U ug/L | 2002-Nov |
| naphthalene | 10 | U ug/L | 2004-Jun |

CO30-PZM060

| | | | |
|-------------|-----|--------|----------|
| benzene | 17 | ug/L | 2002-Dec |
| benzene | 27 | ug/L | 2002-Dec |
| benzene | 4.1 | ug/L | 2004-Jun |
| naphthalene | 1 | U ug/L | 2002-Dec |
| naphthalene | 1 | U ug/L | 2002-Dec |
| naphthalene | 11 | U ug/L | 2004-Jun |

CO35-PZM056

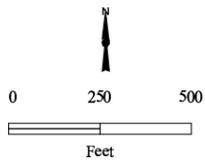
| | | | |
|-------------|-----|--------|----------|
| Benzene | 3.3 | ug/L | 2004-Jun |
| Naphthalene | 7.3 | J ug/L | 2004-Jun |

SW18-PZM114

| | | | |
|-------------|-----|------|----------|
| Benzene | 180 | ug/L | 2002-Nov |
| Benzene | 4.9 | ug/L | 2004-Jun |
| Naphthalene | 940 | ug/L | 2002-Nov |
| Naphthalene | 14 | ug/L | 2004-Jun |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



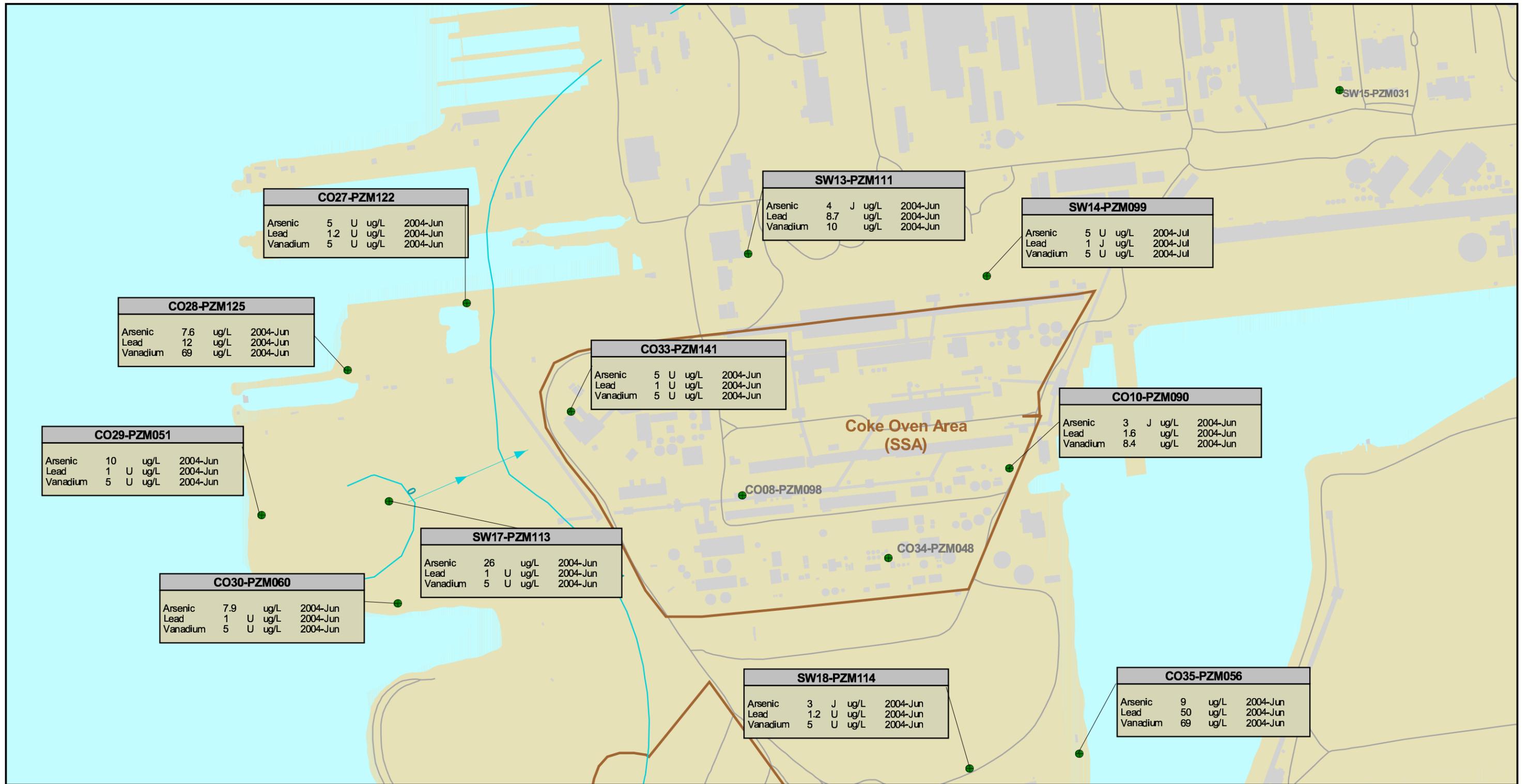
ISG Sparrows Point, Inc.
Coke Oven Area
Lower Groundwater Zone
Benzene and Naphthalene



Figure:
4-15

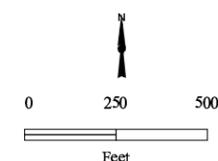
Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (1 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



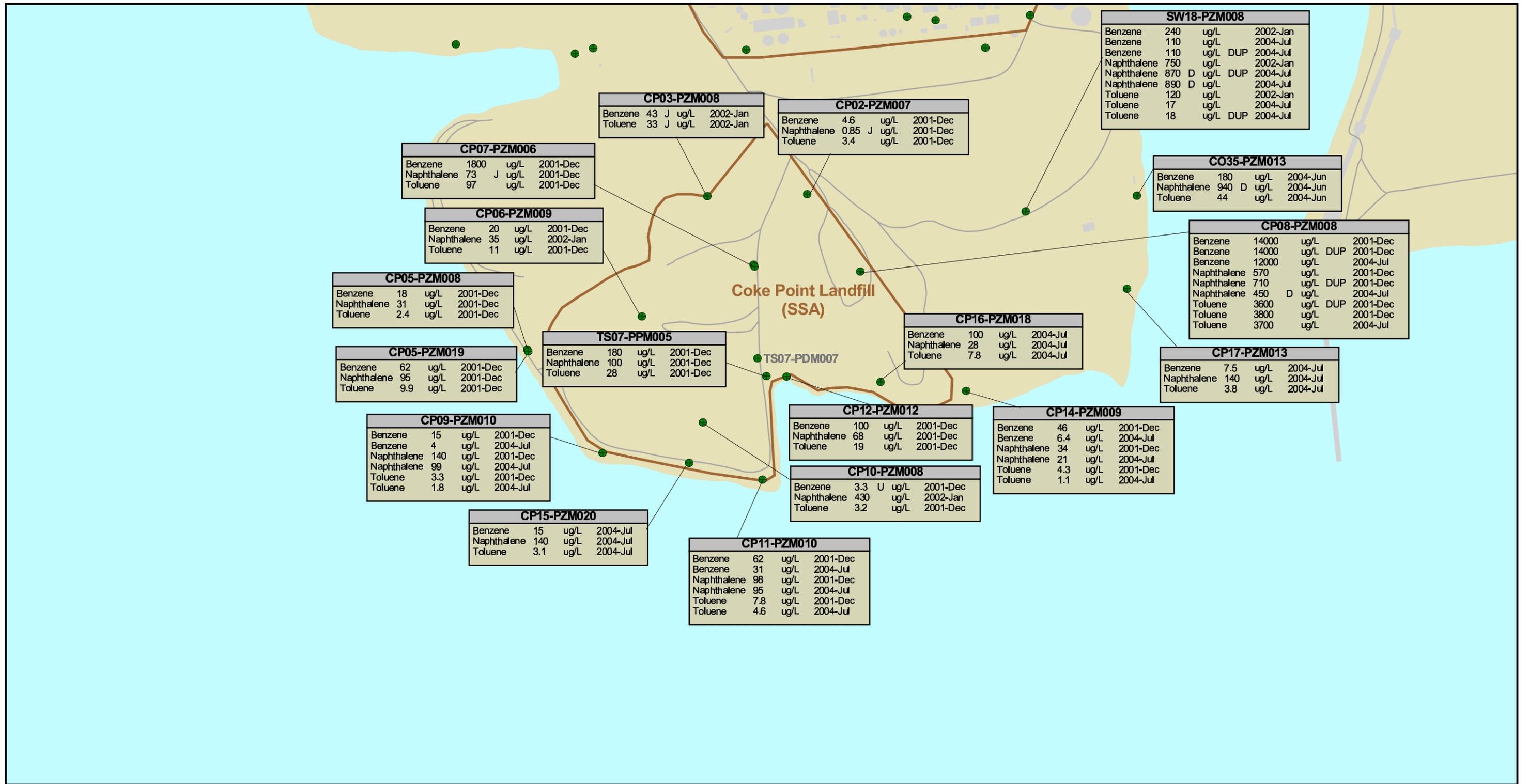
ISG Sparrows Point, Inc.
 Coke Oven Area
 Lower Groundwater Zone
 Total Arsenic, Lead and Vanadium



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

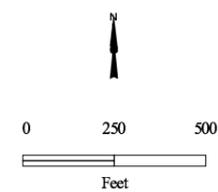


Figure:
4-16



- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

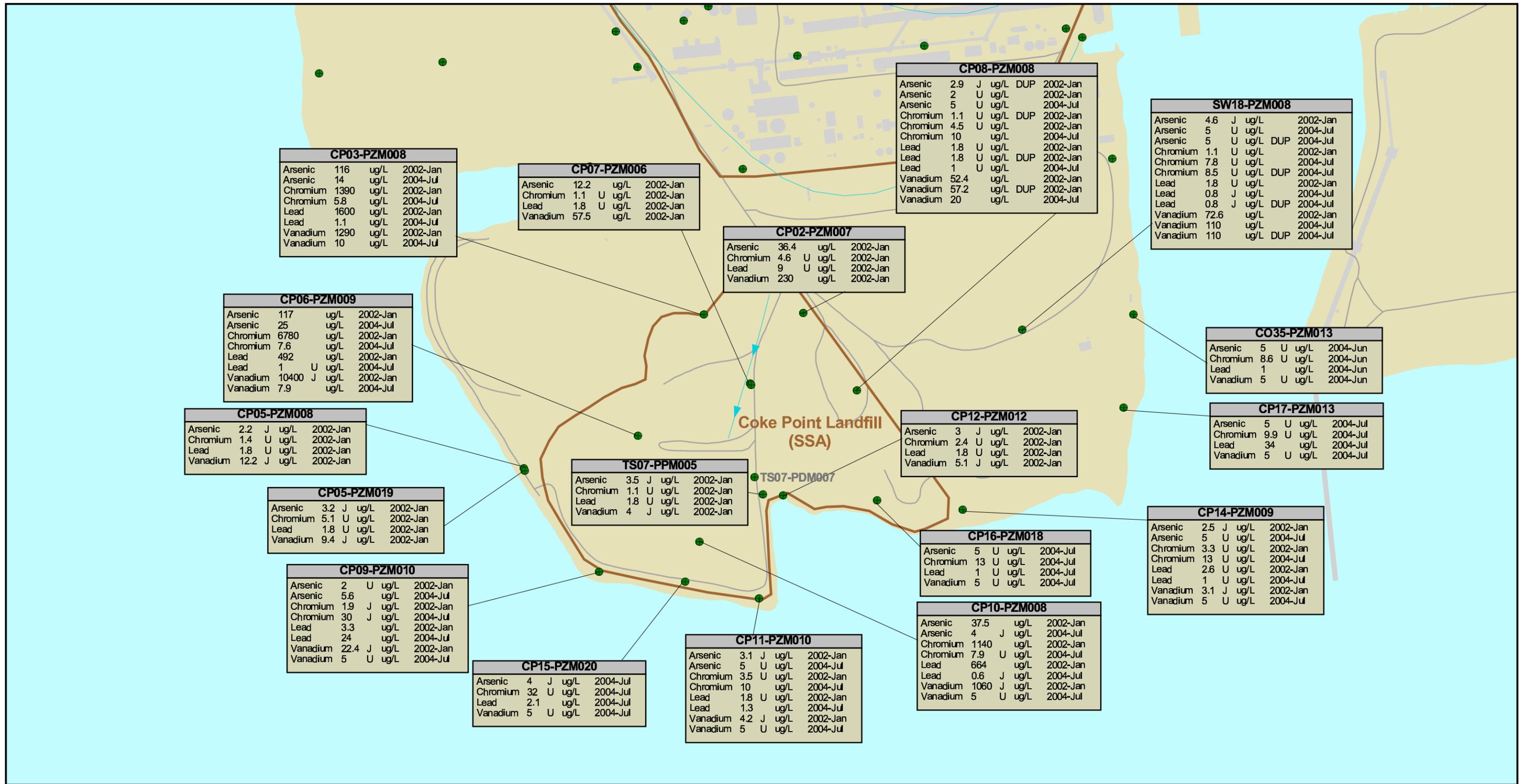
D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



ISG Sparrows Point, Inc.
 Coke Point Landfill
 Shallow Groundwater Zone
 Benzene, Naphthalene and Toluene Results

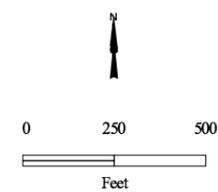


Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.



- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



ISG Sparrows Point, Inc.
 Coke Point Landfill
 Shallow Groundwater Zone
 Total Arsenic, Chromium, Lead and Vanadium Results



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

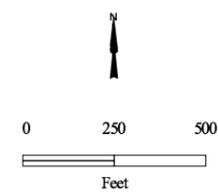


Figure:
4-18



- Monitoring Well Location
- Study Area Boundary
- Water Feature
- Groundwater contour feet above MSL (2 Foot Intervals)
- ↗ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



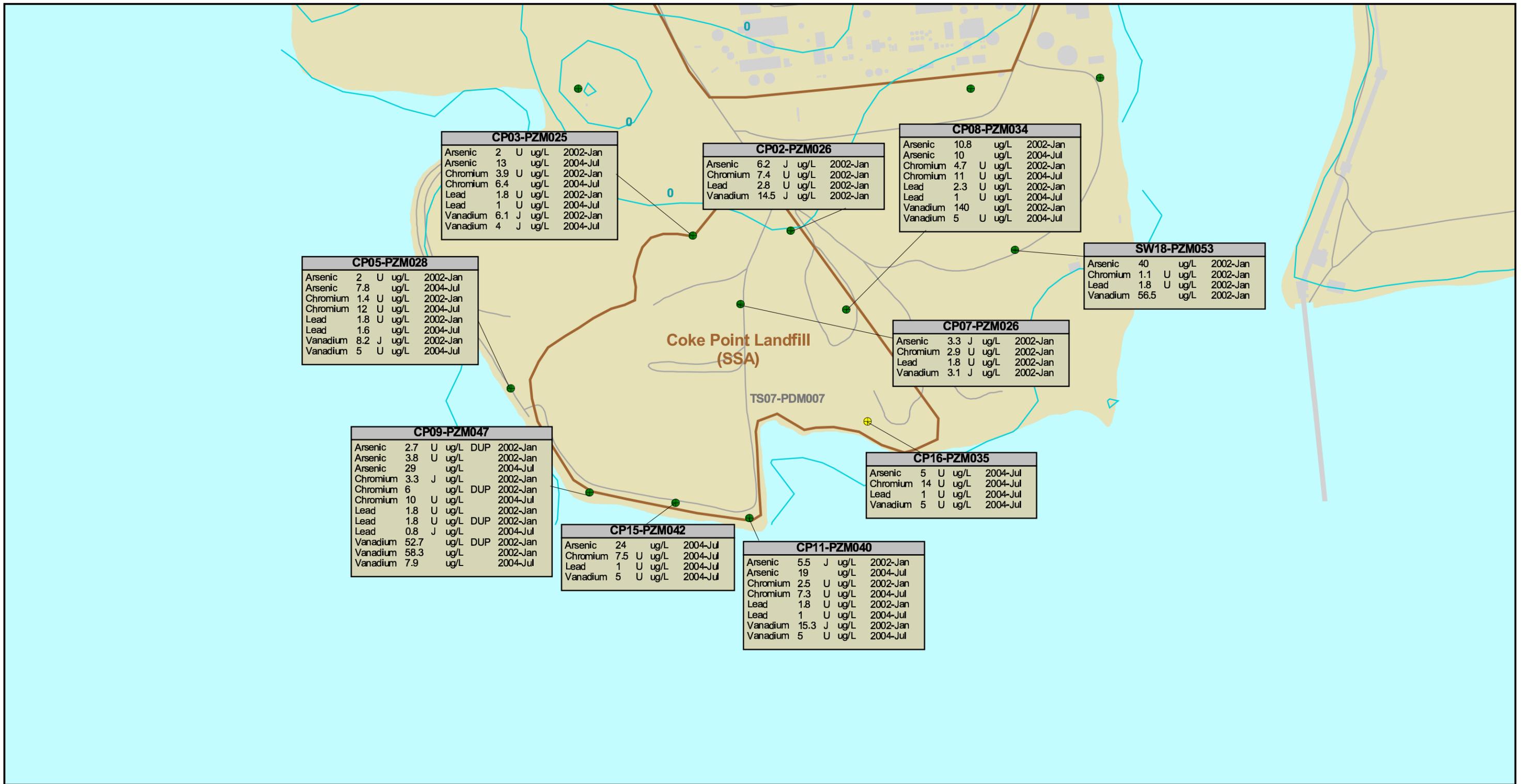
ISG Sparrows Point, Inc.
 Coke Point Landfill
 Intermediate Groundwater Zone
 Benzene, Naphthalene and Toluene Results



Figure:
4-19

Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





● Monitoring Well Location
 Study Area Boundary
 Water Feature
 Groundwater contour feet above MSL (2 Foot Intervals)
 Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.

0 250 500
 Feet

ISG Sparrows Point, Inc.
 Coke Point Landfill
 Intermediate Groundwater Zone
 Total Arsenic, Chromium, Lead and Vanadium Results



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.



CP05-PZM128

| | | | | |
|-------------|-----|---|------|----------|
| Benzene | 1 | U | ug/L | 2004-Jul |
| Naphthalene | 10 | U | ug/L | 2004-Jul |
| Toluene | 0.7 | J | ug/L | 2004-Jul |

SW18-PZM114

| | | | |
|-------------|-----|------|----------|
| Benzene | 180 | ug/L | 2002-Nov |
| Benzene | 4.9 | ug/L | 2004-Jun |
| Naphthalene | 940 | ug/L | 2002-Nov |
| Naphthalene | 14 | ug/L | 2004-Jun |
| Toluene | 38 | ug/L | 2002-Nov |
| Toluene | 3.1 | ug/L | 2004-Jun |

CO35-PZM056

| | | | |
|-------------|-----|--------|----------|
| Benzene | 3.3 | ug/L | 2004-Jun |
| Naphthalene | 7.3 | J ug/L | 2004-Jun |
| Toluene | 1.5 | J ug/L | 2004-Jun |

CP17-PZM058

| | | | |
|-------------|-----|--------|----------|
| Benzene | 0.6 | J ug/L | 2004-Jul |
| Naphthalene | 10 | U ug/L | 2004-Jul |
| Toluene | 1 | U ug/L | 2004-Jul |

CP14-PZM062

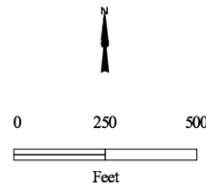
| | | | |
|-------------|------|--------|----------|
| Benzene | 0.43 | J ug/L | 2001-Dec |
| Benzene | 1 | U ug/L | 2004-Jul |
| Naphthalene | 10 | U ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2004-Jul |
| Toluene | 0.42 | J ug/L | 2001-Dec |
| Toluene | 0.8 | J ug/L | 2004-Jul |

CP12-PZM052

| | | | |
|-------------|----|--------|----------|
| Benzene | 50 | U ug/L | 2001-Dec |
| Naphthalene | 10 | U ug/L | 2001-Dec |
| Toluene | 50 | U ug/L | 2001-Dec |

- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



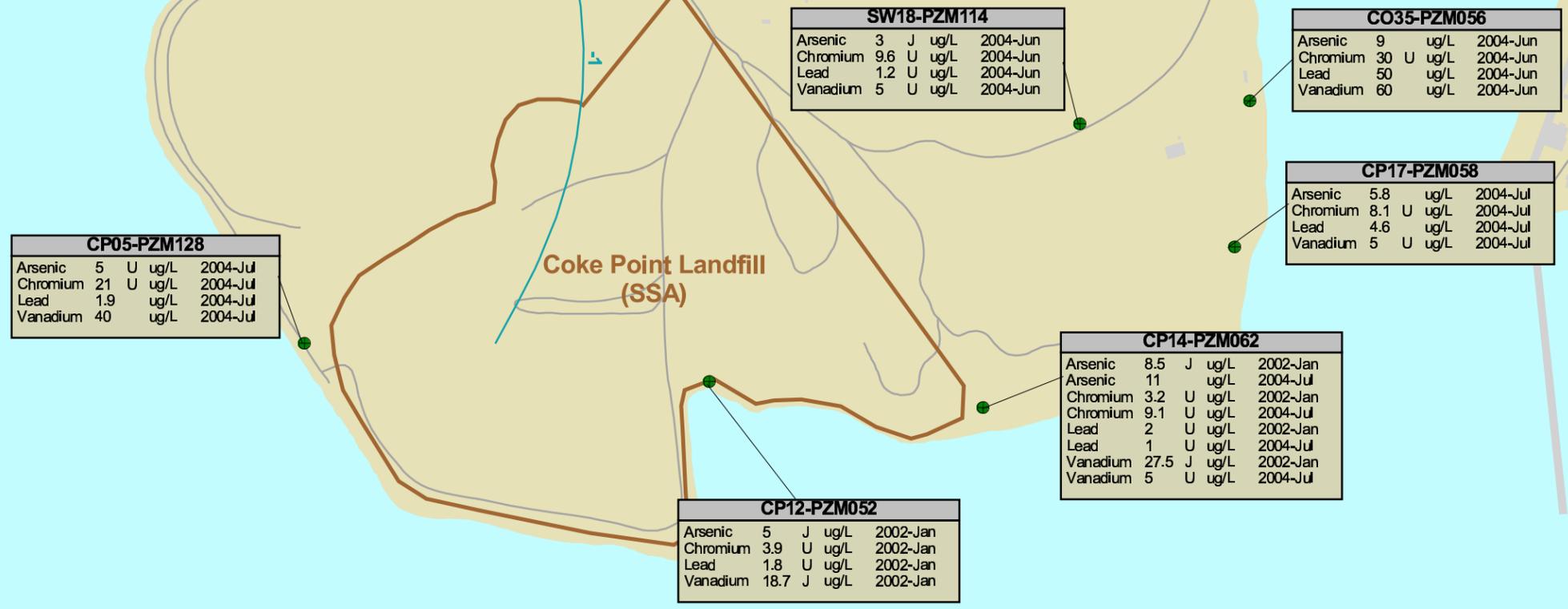
ISG Sparrows Point, Inc.
 Coke Point Landfill
 Lower Groundwater Zone
 Benzene, Naphthalene and Toluene Results



Figure:
4-21

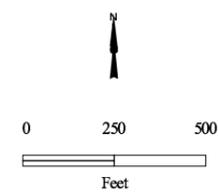
Note:
Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.





- Monitoring Well Location
- ▭ Study Area Boundary
- ▭ Water Feature
- ▭ Groundwater contour feet above MSL (2 Foot Intervals)
- ▭ Groundwater Flow Direction

D = Result reported from a secondary dilution.
 J = Analyte present. Reported value may not be accurate or precise.
 U = The analyte was analyzed for, but was not detected. Also used when the analyte was detected, but not substantially above the level reported in laboratory or field blanks. The associated number indicates the reporting limit.



ISG Sparrows Point, Inc.
 Coke Point Landfill
 Lower Groundwater Zone
 Total Arsenic, Chromium, Lead and Vanadium Results



Note:
 Well locations with no analytical data posted indicate that wells were sampled and analyzed for a select list of analytes which did not include those constituents highlighted on this figure.

In summary, the evaluation of the nature and extent of releases to groundwater from the five SSAs was completed as part of a SWI program required by the Consent Decree entered into by BSC, MDE, and USEPA in October 1997. The purpose of this report is to present the findings of field activities completed as part of the USEPA approved *Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas*, prepared by CH2M Hill dated July 2002 and modified in an addendum to the Nature and Extent Work Plan submitted to the USEPA and the MDE in a letter dated March 12, 2004. The objectives of the N&E activities are to review and update the hydrogeologic model of the Site and to establish the vertical and horizontal nature and extent of the COPs in groundwater at each of the five SSAs: Greys Landfill, Humphrey Impoundment, Tin Mill Canal and Finishing Mills (typically grouped together along with Humphrey Impoundment), Coke Oven Area and Coke Point Landfill. The N&E activities included: the installation of additional piezometers; vertical profiling (IsoFlow[®] sampling) at select locations; the collection of water level measurements; the collection and analysis of groundwater samples in shallow, intermediate and deep locations in each of the five SSAs, additional slug testing, and a tidal study.

5.1 GEOLOGIC CONDITIONS

The regional and local geologic conditions consist of five formations that comprise the Basement/Crystalline, Patuxent, Arundel, Patapsco and Talbot Formations.

The Slag-Fill unit is the uppermost hydrostratigraphic unit at the Site. The water table across the Site occurs within the Slag-Fill Unit and is unconfined. The “shallow” groundwater zone piezometers are screened within the slag/fill unit.

The Talbot Formation (40 to 145 feet thick) underlies the slag and is the uppermost naturally occurring geologic unit in most areas of the Site. The Talbot Formation consists of three units: the Upper Talbot Channel; the Talbot Aquitard; and the Lower Talbot Channel Unit. The Talbot Clay Aquitard separates the Slag-Fill and/or Upper Talbot Channel Units from the Lower Talbot Channel and/or Upper Patapsco Sand Units. The “intermediate” zone groundwater piezometers are generally screened within the upper Talbot Channel unit. The “Lower” piezometers are generally screened within the lower Talbot Channel Unit or the Upper Patapsco Sand Unit. There appears to be only a very slight downward gradient across the Talbot Clay Aquitard. Given the low hydraulic gradient and the low permeability of the aquitard, there would be essentially no significant groundwater flow within or through the Talbot Clay Aquitard when present.

The Lower Talbot Channel Unit is underlain by the Patapsco Formation (145 to 255 feet thick). The Patapsco Formation also consists of three main units: the Upper Patapsco Sand Unit; the Middle Patapsco Clay Aquitard; and the Lower Patapsco Sand Unit. The Middle Patapsco Clay Aquitard (25 to 100 feet at the Sparrows Point Site) is present throughout the Site. No piezometers monitored as part of the N&E were installed beyond the top of the Patapsco Clay Aquitard. The Patapsco Aquitard serves as the lower confining bed for the Upper Patapsco Sand Unit and as the upper confining bed for the Lower Patapsco Sand Unit. With the cessation of pumping from the Patapsco Sand Units since 1945, water levels have recovered to elevations of

around +1 foot amsl. Thus, under current conditions, there may be essentially no significant groundwater flow within or through the Middle Patapsco Clay Aquitard.

The Patapsco formation is underlain by the Arundel Formation. The Arundel Clay Aquitard is present below the Lower Patapsco Sand Unit and is comprised of extremely dense, tight clay. The Arundel Clay Aquitard is present throughout the Site and is an important regional confining layer. The Arundel Formation occurs at elevations of -233 to -333 feet amsl at Sparrows Point. The thinnest section of the Arundel Clay at the Sparrows Point facility is estimated to be approximately 50 feet thick.

The Arundel Formation is underlain by the Patuxent Formation and the Crystalline Basement Rock. The Patuxent Formation underlies the Arundel Formation throughout the Sparrows Point Site and is about 323 feet thick at the Site. The Patuxent Formation is used as a groundwater production zone at the Site and throughout the region.

5.2 GROUNDWATER FLOW

Within the shallow zone, groundwater flow is influenced by surface topographic features, local dewatering activities and surface infiltration. Groundwater flow is generally to the southwest. Radial flow occurs from two groundwater mounded areas; including Greys Landfill and the south central portion of the Sparrows Point peninsula. The natural topographic drainage feature of the Tin Mill Canal controls the groundwater flow in the areas both north and south of the Canal. Natural control of groundwater flow by the Canal is enhanced by wastewater treatment operations at HCWWTP that maintain the water level in the Canal by pumping collected waters to a treatment plant prior to discharge through a NPDES-permitted outfall. Shallow groundwater flow in the Coke Oven and Coke Point SSA areas is generally to the southwest, however as the groundwater approaches the former shoreline, the gradient decreases sharply, and flow direction becomes more radial towards the surrounding surface water. The influence of graving dock pumping within the shallow zone appears to be localized.

Intermediate groundwater flow is generally consistent with flow patterns observed in the overlying shallow zone, however, surface influences are less pronounced. Similar mounding with radial flow was observed in Greys Landfill and in the south central portion of the Sparrows Point peninsula. Groundwater elevations indicate vertical migration into the intermediate groundwater unit from the shallow zone, although the presence of clay and silt layers retards the flow. The downward gradient is most pronounced in areas of groundwater mounding within the shallow zone. The vertical gradient decreases near the shoreline and along the Tin Mill Canal. The drainage and pumping of water from the Tin Mill Canal shows hydraulic control in the intermediate groundwater zone as well. The groundwater flow in the areas both, north and south of the Canal flow toward the Tin Mill Canal. Intermediate groundwater zone flow in the Coke Oven and Coke Point SSA areas is less pronounced, but generally flows towards the surrounding surface water. The influence from dewatering activities at the graving dock is more pronounced (estimated to be over 2,000 feet) in the intermediate zone than the shallow zone.

The groundwater flow in the lower zone is primarily to the southwest with little hydraulic influence from the shallow or intermediate zones. The hydraulic conductivity of the fine-grained

Talbot Clay Aquitard that separates the intermediate groundwater zone from the lower groundwater zone, ranges from 10^{-6} to 10^{-9} cm/sec. The vertical gradient is slightly downward over much of Sparrows Point; however, the vertical gradient is near zero or slightly upward in the southeast portion of the peninsula and along the Tin Mill Canal under current flow conditions.

5.3 VERTICAL AND HORIZONTAL EXTENT

5.3.1 Greys Landfill SSA

Analytical results obtained from samples collected during the RSC and the N&E activities from the Greys Landfill SSA and surrounding areas indicate that impact to the groundwater by the COPI VOCs and SVOC analytes are confined to the shallow groundwater zone near the northern portion of the Greys Landfill SSA. Concentrations of COPI VOC and SVOC analytes in the shallow zone show a decreasing horizontal trend away from the source area and have been defined to be below or approaching laboratory reporting limits in all directions. In vertical extent, COPI VOC and SVOC analytes in the intermediate groundwater zone were not detected or were detected at values approaching the laboratory reporting limits.

A limited presence of COPI metals including arsenic and thallium are present in the shallow and intermediate groundwater. These analytes appear to be confined to the area along the northern border of the Greys Landfill SSA. The measured concentrations are within low $\mu\text{g/L}$ ranges. The sporadic presence of metals in the shallow and intermediate groundwater zones in this area may be related to baseline levels of metals that are present in the fill and native materials at the facility and not associated with the SSA.

Based on the results of the groundwater samples collected during the RSC and the N&E activities and the hydrogeologic conditions present at the Site, the horizontal and vertical extent of COPI analytes have been sufficiently defined for the Greys Landfill SSA. Adequate data has been collected to support subsequent risk-based characterization for this SSA.

5.3.2 Humphrey Impoundment / Tin Mill Canal / Finishing Mills SSAs

5.3.2.1 COPI VOCs and SVOCs

Analytical results obtained from samples collected during the RSC and the N&E activities from the Humphrey Impoundment/ Tin Mill Canal/ Finishing Mills SSAs and surrounding areas indicate that impact to the groundwater by the COPI VOCs and SVOC analytes are generally confined to the area adjacent to the Tin Mill Canal within the shallow and intermediate groundwater zones. The VOC and SVOC concentrations show a decreasing trend from shallow to the lower groundwater zone and are isolated in the area near piezometers TM04 and TM02. The concentrations within the lower zone piezometers (TM04 and TM02) are approaching the laboratory reporting limits. All other COPI VOC and SVOC concentrations of samples collected from the lower zone are below or approaching their respective laboratory reporting limits. During the RSC, elevated 1,1-DCA was detected in the Finishing Mills SSA at FM03 within the

intermediate groundwater zone. During the N&E activities, concentrations of all COPI VOCs at FM03 and surrounding piezometers were below or approaching laboratory reporting limits for samples collected from piezometers installed in lower zones.

Concentrations of COPI VOCs and SVOCs in HI08, located along the shoreline west of the three SSAs, are below or approaching their respective laboratory reporting limits in the shallow intermediate and lower groundwater zones. The COPI VOC and SVOC concentrations in piezometers located along the eastern shoreline east of the three SSAs (SW10 and TS10) are below the laboratory reporting limits.

5.3.2.2 COPI Metals

A limited presence of COPI metals including lead, vanadium, thallium and chromium are present in the shallow and intermediate groundwater associated with the Humphrey Impoundment/ Tin Mill Canal/ Finishing Mills SSAs. Vanadium appears to be the most prevalent in the shallow zone across the three SSAs with the highest concentrations occurring near the Tin Mill Canal and Humphrey Impoundment SSAs. The chromium, lead, thallium and vanadium concentrations decrease with depth to the lower zone. The measured concentrations in the lower groundwater zone are all within the low $\mu\text{g/L}$ ranges. The presence of metals detected in the lower groundwater zones in this area at these concentrations may be related to baseline levels of metals that are present in the natural soils at the facility and not associated with the SSA.

Based on the results of the groundwater samples collected during the RSC and the N&E activities and the hydrogeologic conditions present at the Site, the horizontal and vertical extent of COPI analytes have been sufficiently defined for the Humphrey Impoundment/ Tin Mill Canal/ Finishing Mills SSAs. Adequate data has been collected to support subsequent risk-based characterization for these SSAs.

5.3.3 Coke Oven SSA

5.3.3.1 COPI VOCs and SVOCs

Analytical results obtained from samples collected during the RSC and the N&E activities from the Coke Oven SSA and adjacent areas indicate that COPI VOCs and SVOCs (predominately benzene and naphthalene) have impacted the shallow and intermediate zone. The areal extent of the COPI VOCs and SVOC is confined to the southwestern fill portion of the Sparrows Point peninsula and has not migrated to the area north of the Coke Oven area. The maximum VOC concentrations (predominately benzene) are located at the northwest portion of the Coke Oven SSA. Groundwater with elevated COPI VOCs has migrated toward the southwest and northwest of the Coke Oven SSA and is present at the shoreline. The SVOC concentrations (predominately naphthalene) are more evenly distributed, and the maximum concentrations are located on the eastern half of the Coke Oven SSA.

COPI VOC and SVOC concentrations decrease to below their respective reporting limits or exhibit a significant decreasing trend toward the laboratory reporting limits in all samples collected from the lower groundwater zone piezometers.

5.3.3.2 COPI Metals

A sporadic presence of COPI metals, including arsenic, lead and vanadium, was detected in the shallow and intermediate groundwater zones. Total lead concentrations were elevated in two locations, CO18-PZM006 (18 µg/L) and CO17-PZM005 (16 µg/L). However, in both locations the dissolved concentration was below the laboratory reporting limit, indicating that the total lead concentration may have been influenced by suspended solids in the sample. Vanadium appears to be more prevalent across in the southern portion of the Coke Oven SSA within the shallow groundwater zone.

The total metal concentrations show a general decrease throughout the Coke Oven SSA with depth. The measured concentrations in the lower zone are all within the low µg/L ranges. The presence of metals in groundwater in this area at these concentrations may be related to baseline levels of metals that are present in the native materials at the facility and not associated with the SSA.

Based on the results of the groundwater samples collected during the RSC and the N&E activities and the hydrogeologic conditions present at the Site, the horizontal and vertical extent of COPI analytes have been defined for the Coke Oven SSA. Associated VOC and SVOC groundwater plumes and migration pathways have been defined to the extent practical to the shoreline. This data is adequate to support subsequent risk-based characterization of the SSA.

5.3.4 Coke Point Landfill SSA

5.3.4.1 COPI VOCs and SVOCs

Based on a review of the groundwater results from the RSC and the N&E studies, it appears that the VOC and SVOC impacts (predominately benzene and naphthalene) to groundwater in the shallow zone is highest near the east boundary of the Coke Point Landfill SSA near CP08. VOC- and SVOC-impacted groundwater within the shallow and intermediate groundwater zones extends to the shoreline to the east south and west. The VOC concentrations (benzene) show a two order of magnitude decrease from the source area in all directions. The SVOC (naphthalene) concentrations are more evenly distributed across the SSA.

COPI VOC concentrations, with the exception of acetone, are at or below the laboratory reporting limits in the lower zone. Acetone concentrations were observed at two locations, CP17 and CP14. However, no obvious pattern of occurrence for acetone was observed at the Coke Point Landfill SSA. The acetone occurrences may be present at these isolated locations, or it may be potential laboratory contaminants. Elevated acetone concentrations may also be related to the use of coated bentonite pellets used to seal the annulus of the piezometer. Elevated benzene concentrations detected in SW18 PZM114 during the November 2002 N&E activities are likely due to cross contamination. SW18 was inadvertently screened within a clay layer and recharges slowly. Therefore, it was difficult to properly develop and clean drill water from the piezometer. Subsequent sampling performed in June 2004 showed benzene has decreased to 4.9 ug/L.

COPI SVOC concentrations decrease to below their respective reporting limits or approach the laboratory reporting limits in samples collected from the lower groundwater zone piezometers.

5.3.4.2 COPI Metals

Based on a review of the groundwater analytical results for samples collected during the RSC and the N&E studies, low concentrations of total and dissolved metals are present at isolated locations in the shallow groundwater. During the RSC assessment, elevated concentrations of total lead and total chromium were detected in CP03, CP05 and CP10 within the shallow groundwater zone. These three locations were resampled for COPI total and dissolved metals during the June 2004 N&E sampling event. The June 2004 results showed the total and dissolved lead and chromium concentrations at these three locations were all in the low $\mu\text{g/L}$ range (less than 10 $\mu\text{g/L}$) or below the laboratory reporting limits. These results indicate that the elevated total lead and chromium concentrations detected during the RSC may have been influenced by suspended solids (turbidity) in the samples collected during the RSC sampling event.

Low concentrations of total and dissolved metals are present in the lower groundwater zone including: arsenic, lead, and vanadium. The dissolved vanadium concentration for the sample collected from CP05-PZM128 was less than the laboratory reporting limit of 5 $\mu\text{g/L}$, indicating that the total vanadium concentration may have been influenced by a slightly turbid sample.

The measured concentrations of the COPI metals detected in the Coke Point Landfill SSA during the N&E activities show a general decrease with depth and are within low $\mu\text{g/L}$ ranges in the lower groundwater zone. The presence of the metals in the groundwater in this SSA at these concentrations may be related to baseline levels of metals that are present in the native materials at the facility and not associated with the SSA.

Based on the results of the groundwater samples collected during the RSC and the N&E activities and the hydrogeologic conditions present at the Site, the horizontal and vertical extent of COPI analytes have been defined for the Coke Point Landfill SSA. Associated VOC and SVOC groundwater plumes and migration pathways have been defined to the extent practical along the shoreline. This data is adequate to support subsequent risk-based characterization of the SSA.

5.4 SUMMARY

In closing, ISG has reviewed existing site characterization data, updated the hydrogeologic conceptual model for the facility, and completed the Nature and Extent activities pursuant to the approved workplans and addendums. Based on the results of the nature and extent activities and a review of the hydrogeologic information, the vertical and areal extent of the COPI analytes at the SSAs have been adequately defined to extent practical.

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